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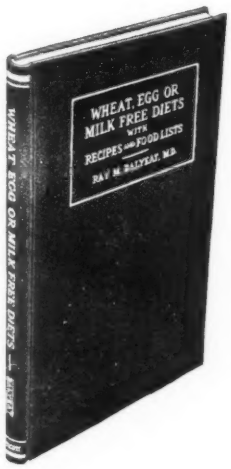

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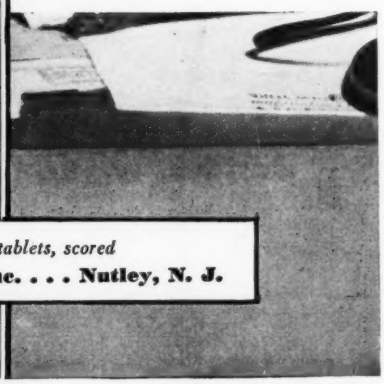

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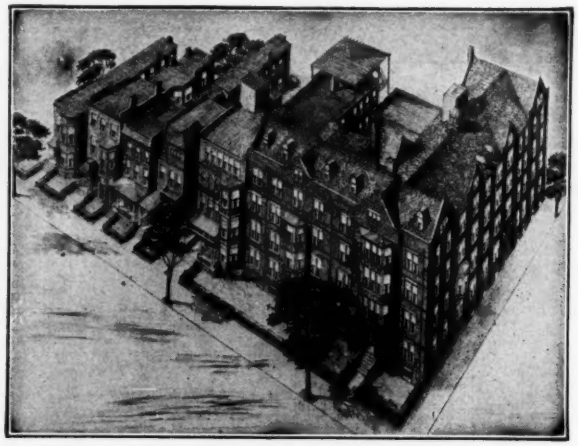

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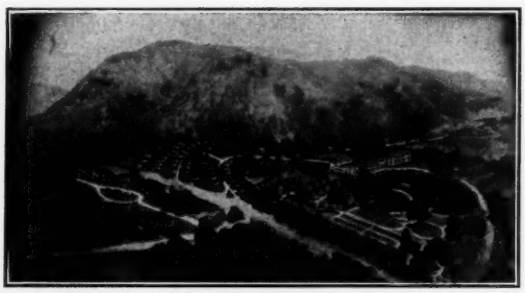

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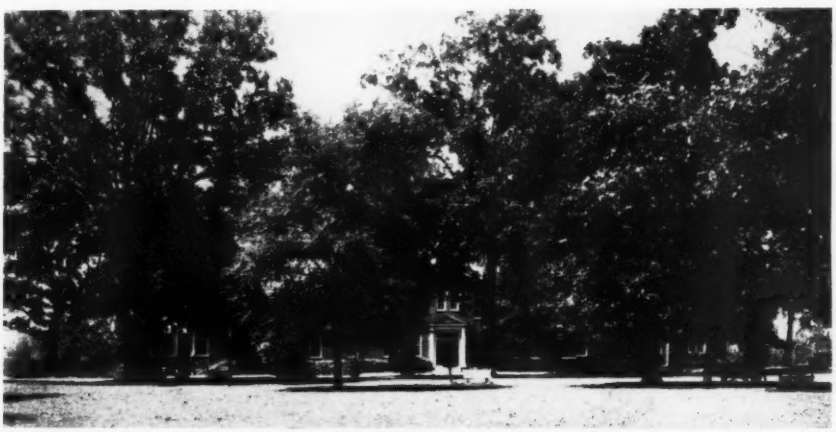

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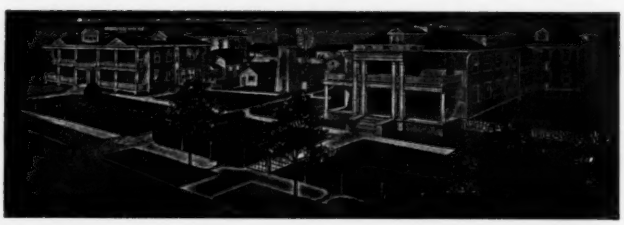

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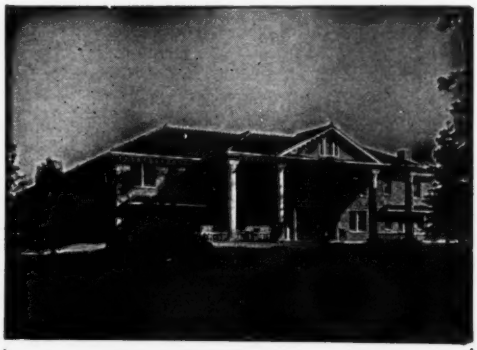

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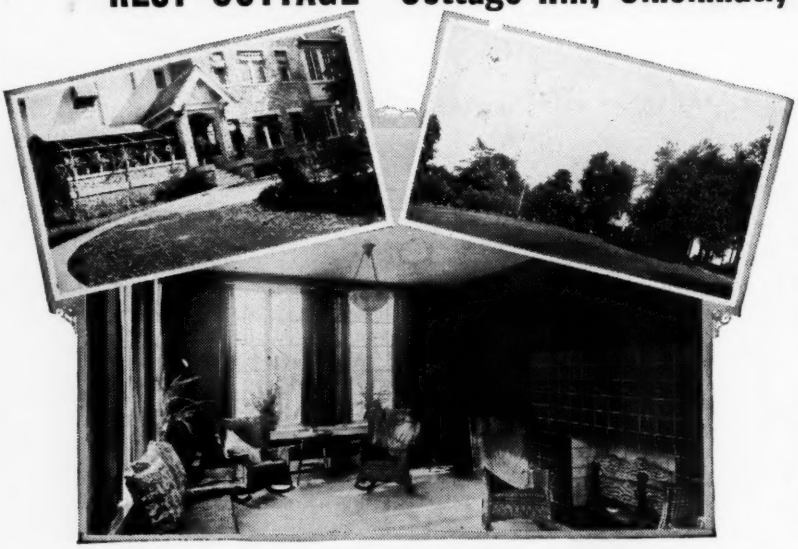

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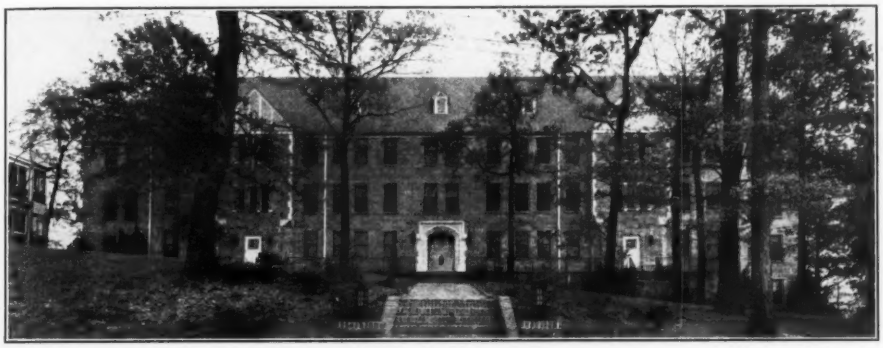

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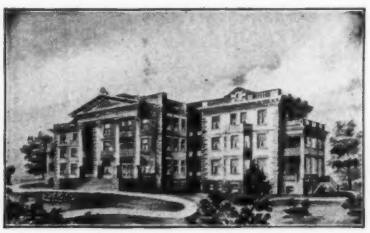

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Volume XXVI MAY 1933 Number 5

CLINICAL ASPECTS OF DIVERTICULITIS OF THE COLON*

By FRANK D. GORHAM, M.D.,
St. Louis, Mo.

Diverticula of the colon were recognized and described by Cruveilhier[1] in 1849 and by Virchow[2] in 1853. Our present interest in this subject may be said to date from 1898, when Graser[3] described the formation of diverticula of the intestines and showed the great frequency with which this condition occurred. Moynihan's[4] important contribution describing the mimicry of cancer by diverticulitis of the colon appeared in 1906. W. J. Mayo, Wilson and Giffin[5] reported the first series of American cases in which operation had been performed in 1907.

There are two types of diverticula of the intestines, both consisting grossly in the formation of a pouch or pocket in the wall of an intestine. In one of these, the whole wall of the viscus takes part in the formation of the pouch and it is believed to be of congenital origin. The foremost representative of this group is Meckel's diverticulum.

In the second type, only the mucosa may herniate through a weak spot in the muscle coat of the bowel and this is described as an acquired or false diverticulum. The manner in which it is formed has not been satisfactorily explained. The chief example of this group, in which we are particularly interested, is the diverticulum of the colon and especially of the sigmoid. Case[6] gave the appropriate name of "diverticulosis" to this condition.

In 1911, Wilson[7] described the secondary changes which followed inflammation of the diverticular sac, which he called "diverticulitis." He stated that

"Colonic diverticula are round or ovid, bottle- or flask-shaped with a narrow neck connecting the sac with the lumen of the intestine."

This formation explains, according to this author, the mechanism of the retention of a portion of a fecal content.

"Inflammatory changes may then occur from the mechanical irritation of a mass which is always rich in pathogenic bacteria. The result is edema or induration with compression of the diverticular orifice and the deposit of connective tissue about the sac producing the so-called peridiverticulitis."

Incidence of Diverticulitis.—Some observers have found diverticula of the colon in one-third of the cadavers of the aged.[8] Spriggs and Marxer[9] found that 10 per cent of their patients examined with the barium meal showed definite evidence of this condition. According to W. J. Mayo, more than 5 per cent of persons over forty years of age have diverticulitis. He bases his conclusions upon Robertson's observations on the postmortem service and the x-ray examinations made at the Mayo Clinic. At St. Luke's Hospital, O. C. Zink found 68 cases of diverticulosis in 1,415 examinations of the colon with barium enema, or 4.8 per cent. According to Ballin,[10] 60 per cent of diverticulitis occurs in the middle aged, symptoms seldom appearing before the fortieth year.

Familial Tendency.—Mackoy,[11] in 1926, reported eight members of a family in three generations who suffered from a chronic intestinal trouble and presented similar clinical pictures. A diagnosis of diverticulitis of the colon was established in two of the cases and a symptomless diverticulosis demonstrated in a third. Since publishing that article, Mackoy has observed three other families in which two or more members showed diverticulitis.* In my own group, there has occurred an instance of brother, sister, and the daughter and son of the sister, all of whom show x-ray evidence of diverticulosis with subjective symptoms sufficient to justify the diagnosis of diverticulitis. Nearly all observers

*Read in Section on Gastroenterology, Southern Medical Association, Twenty-Sixth Annual Meeting, Birmingham, Alabama, November 15-18, 1932.

*Personal communication, April 12, 1932.

Fig. 1
Mrs. J. H. S. Twenty-four hour observation. Several diverticula are seen in the pelvic colon.

are in agreement that diverticulosis of the colon is more frequently found in men than in women.

Symptomatology.—While diverticula may occur anywhere along the gastro-intestinal tract, by far the largest number appear in the lower portion of the sigmoid near the rectal junction. The ascending and first half of the transverse colon are affected less frequently.

In comparing diverticulitis with duodenal ulcer, we notice certain similarities. The incidence of these two conditions corresponds. The relative frequency of occurrence of the two conditions in the sexes is similar. Both are more frequently found in the sthenic individual, and it is especially noteworthy that in both one often finds an autonomic imbalance as denoted by vagus hyperirritability and a segmental spasticity of the intestines. They are similarly characterized by the tenseness shown in psychic behavior. In the duodenum and in the sigmoid colon there are certain mechanical factors that tend to produce trauma, meaning, in part, intraduodenal and intracolonic pressure. A diverticulum of the sigmoid is likely to become infected, while an acquired diverticulum, although microscopic in the first portion of the duodenum, may behave differently because of the presence of gastric juice.

Diverticulitis of the colon may progress from a simple acute type to exudative and occlusive changes or may further progress to an ulcerative, gangrenous state or perforation. Abscess formation with perforation into adjacent organs may occur. It is quite typical for the acute condition to recur at frequent intervals.

Various classifications have been suggested for diverticulitis. Case's classification is as follows:

(1) *Enterospasm type,* including that type of case in which the diverticula, even though numerous and scattered and the symptoms apparently only those of enterospasm, are kept up by continuous renewal of intestinal irritation from the retained contents of the diverticular sacs.

(2) *Hyperplastic type,* where the diverticula are situated fairly close together, especially in the region of the pelvic colon, and on account of their grouping, the peridiverticular inflammatory reaction, and the consequent production of connective tissue, tend to produce a tumor with resulting organic obstruction.

(3) *Pseudo-appendicitis type,* where one or more of the diverticula, even where the saccules are not generally characterized by peridiverticular inflammation, undergoes an acute inflammatory process analogous to that occurring with acute appendicitis.

For clinical purposes, it would seem that the division of acute and chronic would suffice. In the acute type, we have a similar picture to that found in left-sided appendicitis. Diverticulitis should always be suspected in the acute abdomen, especially if the patient is over forty years of age. Chronic diverticulitis is of the greatest importance to the internist. This condi-

Fig. 2
Mrs. J. H. S. Barium enema, showing an irregularity in the pelvic colon, also several diverticula.

Fig. 3

Mrs. J. H. S. Colon after evacuation of enema, showing a few diverticula in the pelvic colon.

tion is usually characterized by recurrent mild or severe intestinal upsets. Colitis, "intestinal flu," or allergy are the usual diagnoses. Often the vagaries of the intestinal dyspeptic are in evidence: abdominal soreness, flatulence, constipation, colon cramps, especially in the early morning and immediately after eating. We often find a fatiguability, vasomotor disturbance, symptoms of profound intoxication that are temporarily relieved by purgatives, especially calomel and castor oil.

Symptoms suggestive of general infection, such as neuritis and arthritis, frequently occur during or immediately following an acute attack. The clinical course of this disease consists of a series of exacerbations and relapses. Seasonal and climatic changes, especially cold, appear to influence the cycles.

It has been my privilege to study the clinical course of certain instructive cases of diverticulosis for a period of ten years. I am convinced that both acute and chronic diverticulitis may present definite symptom complexes, which, if carefully studied, should suggest the disease in question.

CASE REPORT

Mrs. J. H. S. was first examined in 1921, when she was 48 years old. Her chief complaints were recurrent attacks of abdominal pain associated with abdominal discomfort and constipation. The bowel movements seemed inadequate. Gastro-intestinal roentgenological study in 1921 revealed diverticulosis of the sigmoid colon. During the next ten years this particular patient became almost a chronic inva'id. She consulted internists in Baltimore, Boston, and New York. Her acute abdominal symptoms were never definitely surgical. It was especially interesting that numerous gastro-intestinal roentgenological studies were made, but only two revealed the presence of diverticula.

When I examined her during the milder attacks, the abdomen was often distended with gas and there was tenderness along the course of the spastic palpable colon, and there was occasionally a slight rise in temperature and a moderate leucocytosis with some nausea, but no vomiting. Heat to the abdomen seemed to relieve; cold made the symptoms worse. Oil enemata were at times soothing. She stated that colonic irrigations and water enemata appeared to make her more toxic. Sedatives, antispasmodics and bismuth seemed helpful. She would lose weight during three or four days of complete invalidism. A condition which she designated as her "calomel time" occurred on an average of twice a month. Associated with these subacute attacks there was a troublesome bladder irritation and she later developed a low grade cystitis, showing colon bacilli in the urine. She was a follower of various popular diet fads, always returning to her calomel for relief, even against the advice of the consulting physician.

In November, 1931, she complained of more discomfort in the abdomen, especially in the left lower quadrant. Bladder symptoms were more troublesome. Purgatives were less effectual. The stool was of small caliber with mucus and blood. There was tenderness with a mass in the left lower quadrant of the abdomen. Repeated proctoscopic examinations were negative. A barium enema showed marked spasticity and a filling defect of the sigmoid colon at the same site

Fig. 4

Mrs. J. H. S. Barium enema, after resection of the involved area. Note the point of anastomosis just above and slightly to the right of a rather large newly formed diverticlum.

where the original diverticula had been found ten years before. Malignancy was suspected.

On March 6, 1932, she developed an acute abdomen with fever and leucocytosis and was taken to St. Luke's Hospital. Although the history and localized left-sided tenderness were suggestive, both the consulting surgeon and internist favored the diagnosis of left-sided appendicitis. Because of the marked bladder symptoms, a genito-urinary consultant made a cystoscopic examination. At operation on March 7, a mass was found localized in the pelvic colon with glands which caused the operating surgeon, Dr. Roland Hill, to suspect a malignant growth. A two-stage operation was performed. When the mass was later removed, microscopic examination did not reveal evidence of a malignancy. Several diverticula were found with abscess formation. Polypi were present which probably accounted for the persistent blood in the stool. It is now eight months since the operation. There has been improvement in her subjective symptoms. She has gained weight. Certainly the constipation has been less pronounced. It is especially noteworthy that her symptoms of arthritis, neuritis and sinusitis have practically disappeared since operation. A barium enema on October 18 revealed a very large diverticulum of the sigmoid colon that did not appear on the older films.

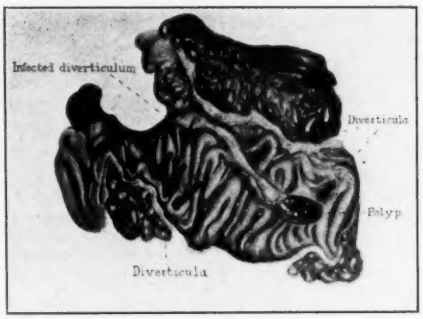

Fig. 5

Mrs. J. H. S. Colored drawing of fresh specimen removed at operation. The sigmoid has been laid open to show the mucosa. It shows an elongated hemorrhagic polyp, at the base of which is an infected diverticulum. Three diverticula are shown, into which probes have been inserted. Note that these diverticula are thin walled sacs of the mucosa which protrude through the muscle layers of the sigmoid.

While the patient had been examined by many internists, not one ever emphasized the possibility that the diverticulitis was a causative factor in her symptom-complex. On the contrary, she was told to forget about her diverticula as they were of no consequence.

COMMENT

It is true that the chief diagnostic difficulty of chronic diverticulitis lies in the multiplicity of subjective symptoms that may occur, none of which is pathogonomonic or major in character, and that it is only by finding the typical shadow on the x-ray plate or by the inspection of the diverticulum at operation or on the post mortem table that we can be sure of our diagnosis. The x-ray is not infallible. If there exists much inflammation about the neck of the

Fig. 6

Mr. A. P. T. Six hour observation following gastric meal, showing numerous diverticula in the pelvic colon, and a few in the region of the hepatic flexure.

Fig. 7

Mr. A. P. T. Barium enema, showing spasticity and many diverticula of the pelvic colon. Also a few large diverticula in the hepatic flexure.

Fig. 8

Mrs. P. G. S. Colon after partial evacuation, showing many diverticula in the pelvic colon that were obscured by distention of the barium enema.

diverticulum, due to obstruction, it cannot be visualized. The length of the neck gives information as to the degree of infiltration. The position of the diverticulum may also affect its visualization. The proctoscopic examination is usually only of negative value. In the differential diagnosis carcinoma is most important. It is most probable that malignancy occurs independently of diverticulosis. The differential diagnosis between carcinoma and diverticulosis of the sigmoid may at times be impossible, except by biopsy. Blood may occur in the stools in both conditions. The presence of diverticula in other portions of the intestine does not exclude carcinoma. Tuberculosis, actinomycosis, and lues should be kept in mind.

Because of the chronic subjective symptoms, these patients undergo frequent diagnostic studies. Often much emphasis is placed upon probable cholecystitis, appendicitis, colitis, abscessed teeth, and chronic tonsillitis. Many internists treat lightly the finding of diverticulosis of the colon and look elsewhere for the cause of the intestinal and constitutional symptoms. It is probable that all acquired diverticula, especially of the colon, show at some time inflammatory changes and are potentially a source of infection and irritation, and are thereby directly or indirectly accountable for symptoms.

It may be surmised that acute and chronic diverticulitis of the colon is a comparatively common disorder. If this be so, then the role of this disease appears to be important if we are to continue to accept focal infections as possible etiological factors in certain systemic conditions. Especially is this true when we consider the effect of the mobility and peristaltic action of the intestines upon any inflammatory condition that may occur within their walls. The lymphatics of the intestines serve as conveyors par excellence of toxins and infection. An acquired diverticulum of the colon differs from an appendix, tooth, or tonsil in that it originates on a pathological basis, diverticulitis being only a stage in its life history.

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DISCUSSION (*Abstract*)

Dr. H. L. Bocus, Philadelphia, Pa.—My interest in colonic diverticulosis was markedly stimulated a number of years ago as a result of a visit to the clinic of Dr. Spriggs at Ruthin Castle in Wales. This occurred at a time when Dr. Spriggs and Dr. Marxer were preparing the material for the splendid contribution which they made to the literature on this subject. They divide diverticular disease of the bowel into three stages. Probably the most important part of their contribution was the original description of a so-called stage of prediverticulosis. This was made possible by the very careful and thorough roentgenographic method employed by Dr. Marxer in the study of the colon. The x-ray appearance of the bowel following barium enema in these cases is the presence of multiple fine convexities

giving the segment of bowel involved a fine saw-tooth appearance somewhat similar to the normal valvulae conniventes markings of the small bowel. They have followed cases showing this peculiar type of bowel defect for a number of years and have observed the development of mature diverticula in the same area of the bowel in some cases. I have frequently observed this type of bowel irregularity in cases in which actual diverticula were noted in other segments of the bowel. A second stage of the disease is spoken of as diverticulosis; diverticula are present in the bowel, but there is no clinical or roentgenographic evidence of inflammation of the pouches. I am in accord with Dr. Gorham's views that many cases have intermittent bowel symptoms probably dependent upon a low-grade irritation of the diverticula or upon concomitant spastic phenomena. The inflammation in many cases is insufficient to dignify with the designation diverticulitis. The third stage of the disease is diverticulitis, that is, there is an actual inflammation of the diverticular pouches.

The cases of diverticulitis which I have seen divide themselves roughly into two distinct clinical types. First those cases with symptoms of acute inflammation akin to the clinical picture of acute appendicitis except that the symptoms are left-sided and that they are more prone to develop in obese individuals in the latter half of life. The second clinical type resembles very closely carcinoma of the colon, usually of the sigmoid segment. The symptoms are often dependent upon a partial obstruction which is due to a gradual fibrosis of the segment of the bowel involved as a result of a generalized, chronic, inflammatory process. Many of these cases present with a palpable mass in the abdomen. In some instances the differential diagnosis between cancer of the bowel and diverticulitis is impossible. Dr. Abell showed a case of this type yesterday at the general meeting. If the barium enema shows diverticular out-pouchings either above or below the stenosing lesion, of course, a diagnosis of peridiverticulitis will be made rather than carcinoma.

Although diverticula are frequently missed in the ordinary cursory study of the bowel by x-ray, if the barium enema technic described by Spriggs and Marxer is followed, the diagnosis is possible in almost every case. Barium enema is the diagnostic method of paramount value, although some prefer the mouth meal. In doubtful cases certainly the mouth meal should be given in conjunction with the barium enema. Diverticula in the transverse colon probably offer the greatest difficulty because of the inability to get films at the proper angle in every case. In the diagnosis of actual inflammation of the diverticular pouches, Spriggs and Marxer draw attention to the frequent crescentic appearance due to barium in the base of the pouch, indicating the presence of a stercolith within the diverticulum which prevents its complete filling. They suggest that this is indicative of poor drainage of the diverticular pouch resulting from inflammatory changes because of narrowing or swelling of the neck of the diverticulum. Dr. Gorham has justly stressed the necessity for thinking of diverticulitis in all obscure cases manifesting symptoms referable to the abdomen, particularly in obese persons past the age of forty.

ATROPHIC AND HYPERTROPHIC ARTHRITIS OF THE SPINE*

By A. R. SHANDS, JR., M.D.,
and
M. O. OATES, M.D.,
Durham, N. C.

Within recent years there have been few, if any, contributions to the literature on the clinical aspects of arthritis of the spine. In contrast to this scarcity of articles dealing with the subject, back pain is one of the most frequent symptoms that causes patients to seek the services of the orthopedic surgeon, and spinal injuries are involved in perhaps 20 per cent of cases seen in industrial practice. The economic loss so entailed, to say nothing of the physical suffering to which these patients are prone, renders this subject one of tremendous importance to all physicians, and justifies, we hope, the following analysis of the cases seen in the Duke Hospital since its organization more than two years ago.

Inasmuch as clinical observations are faulty at best and vary in content according to the special interests of different examiners, it has been thought best to classify these cases on the basis of x-ray findings. Of the 668 patients (*Table 1*) whose spines have been x-rayed, 243

Table 1

CLASSIFICATION OF CASES FOR WHICH SPINE X-RAYS WERE TAKEN

	No.	Per Ct.
(1) Atrophic and hypertrophic arthritis	243	36.4
(2) Fractures and dislocations	45	6.7
(3) Tuberculosis	32	4.8
(4) Non-Tb. infection and retroperitoneal abscess	16	2.4
(5) Spinal curvature and congenital defects	25	3.7
(6) Back injuries, including sprains	44	6.6
(7) Carcinoma metastases and other tumors	33	5.0
(8) Neurological disorders, including neuroses	61	9.1
(9) Cardio-respiratory disorders	8	1.2
(10) Gastro-intestinal disorders	15	2.2
(11) Genito-urinary disorders	8	1.2
(12) Gynecological disorders	16	2.4
(13) Miscellaneous	122	18.3
Total	668	100.0

(36.4 per cent) seem definitely to have had arthritis of the spine. For the purpose of this study, the classification recommended by the American Committee for the Control of Rheumatism[1] was adopted, and the cases have ac-

*Read in Section on Bone and Joint Surgery, Southern Medical Association, Twenty-Sixth Annual Meeting, Birmingham, Alabama, November 15-18, 1932.

*From the Department of Orthopedic Surgery, Duke University School of Medicine.

cordingly been divided into the atrophic and hypertrophic types (*Table 2*). The term "infectious arthritis" has been avoided, lest the unjustified inference be drawn that the etiology of this condition is established with certainty.

Table 2

TYPES OF ARTHRITIS CLASSIFIED ACCORDING TO THE CLINICAL AND X-RAY FINDINGS

	No.	Per Ct.
(1) Atrophic 78; per cent 32.1		
(a) With x-ray changes	50	20.5
(b) Without x-ray changes	12	5.0
(c) Strumpell-Marie	16	6.6
(2) Hypertrophic 165; per cent 67.4		
(a) True types	164	67.0
(b) Von Bechterew type	1	0.4
Total	243	100.0

Fig. 1
Hypertrophic arthritis of lumbar vertebra, showing marginal lipping and spur formation.

Fig. 2 a
Advanced hypertrophic arthritis of lumbar spine and right sacro-iliac, showing lipping, spur formation, bony bridging, and proliferation of bony knobs. It is interesting to note the complete ankylosis of the upper margin of the sacro-iliac joint.

Moreover, the Strumpell-Marie cases (classified by Steindler[2] as an atrophic arthritis) and the von Bechterew spines (classified by Steindler[2] as a form of hypertrophic arthritis) have been listed and discussed separately.

In this series 164 (67 per cent) showed definite hypertrophic arthritic changes, such as lipping, spurring, and bridging of the intervertebral facets, articulations and discs (*Figs. 1* and *2*). There were 50 cases (20.5 per cent) which showed evidence of bone atrophy and blurring or haziness about the articular facets and intervertebral discs, but no hypertrophic bone changes. Of the Strumpell-Marie cases there were 16 (6.6 per cent). One patient showed hypertrophic changes which are believed to be of the von Bechterew type and 12 patients had definite clinical symptoms of arthritis of the spine without confirmatory x-ray evidence. These, perhaps, should be included with the atrophic group, in spite of the negative x-ray findings, thus increasing the number of atrophic arthritic cases to 62 (25.5 per cent). The Strumpell-Marie cases were diagnosed first on the clinical symptoms and in a great many in-

Fig. 2 b
Anterior-posterior x-ray of Fig. 2 a, showing how difficult it is completely to visualize in an x-ray the extensive bony changes seen in the drawing.

stances the x-ray findings did not altogether bear out this grouping. However, it is known that the x-ray changes in these conditions sometimes are very late in appearing and that the clinical evidence is worth more than the x-ray evidence.

Except for the Strumpell-Marie and the von Bechterew cases, the patients have been grouped according to the portion of the spine involved: the cervical, dorsal, or lumbar portions, as the case may be, and whether the condition involved the lumbosacral or the sacro-iliac joints. In 35 of the 243 patients more than one area of the spine was involved; such cases have been listed under both groups. For example, a case showing evidence of changes in the dorsal and lumbar spines has been analyzed both with the dorsal spine and with the lumbar spine. The analysis of these clinical data has been made according to: (1) sex; (2) age at onset; (3) trauma as an etiological factor; (4) correlation of symptoms and signs; (5) whether the patients have or have not radiation of pain; and (6) correlation of the x-ray changes with the signs and symptoms.

Sex.—Fifty-seven and six-tenths per cent of the patients were men and 42.4 per cent women. In the hypertrophic cases the percentage of men was slightly higher, being 59.1 per cent against 40.9 per cent women. In the atrophic cases, on the other hand, there was a higher percentage of women than men, the proportion of women being 56 per cent to that of 44 per cent for men. An analysis of the table of the relationship according to the area of the spine involved shows that there were twice as many men in the sacro-iliac group as women. In the lumbosacral and cervical spine groups the sexes were evenly affected. The lumbar and dorsal spine groups showed three men for every two women. In the Strumpell-Marie group there were four men to every one woman.

Age at Onset (*Table 3*).—This was determined by subtracting the average duration of symptoms from the average age at the time of examination. It is believed that the age at onset is a much more important statistical fact than the duration of the symptoms or the age at examination. Those cases showing involvement of the lumbosacral and sacro-iliac portions showed an average age of 33 years, and the cervical groups showed an average age of 46 years. The average age at onset of the atrophic arthritic cases of the lumbar spine was approximately 4 years less than the average for this group. The average age at onset of the lumbosacral and sacro-iliac conditions was the same for the hypertrophic and atrophic groups.

Table 3

AVERAGE AGE AT ONSET OF ARTHRITIS
(Atrophic and Hypertrophic)

	Years
(1) Cervical spine (21 cases)	45.7
(2) Dorsal spine (42 cases)	41.7
(3) Lumbar spine (122 cases)	42.0
(4) Lumbosacral (40 cases)	33.4
(5) Sacro-iliac (37 cases)	33.0
(6) Strumpell-Marie (16 cases)	23.6

Etiology.—It is rather difficult to determine etiological factors. However, in most instances some note was made on the history as to whether or not trauma had played a part in the condition. This analysis shows that trauma as an etiological factor (*Table 4*) in the lower part of the back was much more frequent than in the case of disease of the middle and upper parts of the back. There was a history of antecedent trauma in 40 per cent of the cases in which the lumbosacral and sacro-iliac regions were involved. The remainder of the areas of the spine was approximately the same, being between 22 and 24 per cent. Only a very small percentage of the Strumpell-Marie spines showed any evidence of trauma. There were 7 women who dated the onset of their disability from childbirth. Of these, 3 were in the sacro-iliac grouping, 2 in the lumbosacral, 1 in the lumbar spine, and 1 in the cervical spine. Two cases dated their trouble from the onset of influenza and one from typhoid fever. The case with a history of typhoid fever showed nothing similar to that which has been described as a typhoid or "Gibney" spine.

Table 4

TRAUMA AS AN ETIOLOGICAL FACTOR

	No.	Per Ct.
(1) Cervical spine (22 cases)	5	22.7
(2) Dorsal spine (40 cases)	9	22.5
(3) Lumbar spine (122 cases)	30	24.6
(4) Lumbosacral (40 cases)	16	40.0
(5) Sacro-iliac (37 cases)	15	40.5
(6) Strumpell-Marie (16 cases)	2	12.5
Total	77	*27.8

*Average.

Symptoms and Signs.—It is believed that there might be some value in determining whether the pain had been intermittent or constant. The analysis of these data, however, disclosed nothing unusual. Approximately 70 per cent of the patients reported intermittent pain and 30 per cent constant pain. The pain apparently had been more constant in the cases of arthritis of the cervical spine than in the other regions. The severity of the pain in the

various patients did not seem in any way significant. Radiation of the pain, on the other hand, did seem to be of significance (*Table 5*).

Table 5

RADIATION OF PAIN

	No.	Per Ct.
(1) Cervical spine (22 cases)	14	63.6
(2) Dorsal spine (41 cases)	8	19.5
(3) Lumbar spine (118 cases)	51	43.2
(4) Lumbosacral (40 cases)	19	47.5
(5) Sacro-iliac (37 cases)	24	64.8
Total	116	*44.9

*Average.

There was radiation of pain in 64.8 per cent of the patients with sacro-iliac involvement and in 63.6 per cent with involvement of the cervical spine. The least amount of radiation of pain occurred in the cases of arthritis of the dorsal spine. In the lumbosacral conditions the radiation was four times more common down both legs than down one leg, and in the sacro-iliac group seven times more common down one leg than down both legs.

It has been thought that it might be of some practical value to attempt to correlate the symptoms with the signs (*Table 6*). The important

Table 6

CORRELATION OF SYMPTOMS WITH SIGNS

	Per Cent Greater than Signs	Per Cent Equal to Signs	Per Cent Less than Signs	Per Cent Without Signs
(1) Cervical spine (18 cases)	0.0	44.4	27.7	27.7
(2) Dorsal spine (40 cases)	5.0	57.7	22.5	15.0
(3) Lumbar spine (116 cases)	12.9	71.5	9.4	6.0
(4) Lumbosacral (40 cases)	7.5	70.0	5.0	17.5
(5) Sacro-iliac (37 cases)	10.7	64.8	10.7	13.5
Average	9.5	66.1	12.3	11.9

points in the symptoms were the character of the pain, its degree, and radiation. Constant pain was considered to be of more significance than intermittent pain. The important points in the signs were believed to be the degree, amount, and extent of tenderness; whether there was limitation of motion through the spine and the degree of this limitation; whether there was a deformity present; and the apparent incapacitation of the patient for his normal activity. It is realized that this correlation is entirely a personal opinion and would certainly vary in the minds of different observers. In the lumbar spine and lumbosacral conditions there were from 70 to 72 per cent of the cases showing symptoms equal to the signs. Sixty-five per cent of the sacro-iliac lesions showed this equality, 58 per cent of the dorsal spines, and 44 per cent of the cervical spines. Very few of the cases showed symptoms greater than the signs. The lumbar spine and the sacro-iliacs showed from 11 to 13 per cent. The cervical spine showed no cases in this grouping, and the dorsal spine and lumbosacral conditions varied from 5 to 8 per cent. There were, however, a great many more cases whose symptoms were considerably less than the signs. Twenty-eight per cent of the cervical spine conditions were in this grouping, 23 per cent of the dorsal spines, 9 per cent of the lumbar spines, 11 per cent of the sacro-iliacs, and 5 per cent of the lumbosacral conditions. In examining painful backs one sees a great many patients who present symptoms without apparent signs. In this grouping the cervical spine showed 28 per cent, the lumbosacral 18 per cent, the dorsal spine 15 per cent, the sacro-iliac 14 per cent, and the lumbar spine 6 per cent.

X-Ray Study.—The question which arises in the diagnosis of these conditions is: how much will the x-ray help in making the diagnosis? This information is of extreme importance, because it determines very often the line of treatment. It is thought that the congenital pathological changes through the lumbosacral joint are so variable that they should not be included in the analysis with the other conditions. In the interpretation of the x-rays particular attention has been paid to the presence of lipping, spurring, beak formation, and bridging between vertebral bodies and across the articular facets (*Figs. 1* and *2*). The degree of x-ray changes was estimated and correlated with the degree of signs and symptoms (*Table 7*). It is found

Table 7

CORRELATION OF X-RAY CHANGES WITH SIGNS AND SYMPTOMS

	Per Cent Greater than S and S	Per Cent Equal to S and S	Per Cent Less than S and S	Per Cent Without X-Ray Changes
(1) Cervical spine (22 cases)	9.0	36.3	22.7	31.8
(2) Dorsal spine (43 cases)	23.3	41.9	7.0	27.9
(3) Lumbar spine (118 cases)	38.1	45.3	12.7	6.8
(4) Lumbosacral (40 cases)	....	....	....	....
(5) Sacro-iliac (37 cases)	16.2	48.6	2.9	32.4
Average	28.6	42.7	10.9	17.7

that in the sacro-iliac conditions the x-ray changes equal the signs and symptoms in 49 per cent of the cases; and in the dorsal spines 42 per cent, in the lumbar spines 45 per cent,

and cervical spines 36 per cent. The x-ray changes were greater than the signs and symptoms in 38 per cent of the lumbar spines, 23 per cent of the dorsal spines, 16 per cent of the sacro-iliacs, and 9 per cent of the cervical spines. X-ray changes were less than the signs and symptoms in 23 per cent of the cervical spines, 13 per cent of the lumbar spines, 7 per cent of the dorsal spines, and 3 per cent of the sacro-iliacs. The patients who have signs and symptoms without x-ray changes present an interesting group. The sacro-iliacs and cervical spines showed 32 per cent, the dorsal spines 28 per cent, and the lumbar spines 7 per cent.

Willis[3] has shown in the analysis of 625 specimens of the lumbar spine that there is a distinct difference found in the degree of the hypertrophic arthritic changes, according to the age of the individual, as well as in the type, such as the heavy, average, and slender. According to his work, there is very seldom found to be any lipping before 35 years of age. Between 35 and 40 there are different degrees of lipping which is always most marked in the heavy type of individual. At 45, 83 per cent of the heavy individuals showed changes, and only 10 per cent of the slender individuals. At 50, practically 100 per cent of the cases of the heavy type showed changes. At the age of 55, 100 per cent of the average group showed these changes, and at 60 years, 100 per cent of the slender individuals. Willis' study certainly shows conclusively that x-ray changes through the spine develop normally with age. These changes without symptoms cannot be considered significant. Then, the question which arises is: how significant are x-ray changes with symptoms if there are found x-ray changes present normally? The only answer to this question is that lipping and spurring through the spine may be aggravated by trauma and infection and may be the cause of prolonging pain and disability of the part. It is certainly not fair to say that because the patient shows x-ray evidences of hypertrophic arthritis these spurs and lippings are the one and only cause of the back pain, for there are other etiological factors to be considered. The metabolic, infectious and occupational factors can sometimes be found and corrected with much relief to the patient.

The x-ray changes through the lumbosacral joint are always so variable that it is rather hard to analyze these with other groups. It has been said that the lumbosacral spine is as variable as an individual's face. There are 7 cases of the 40, or approximately 18 per cent, in which the x-ray changes are equal to the signs and symptoms. There is one case in which the changes are greater than the signs and symptoms and there are no cases in which the changes were less than the signs and symptoms. There were 15, or 38 per cent, of the cases who showed no arthritic x-ray changes through the lumbosacral joint. Seventeen cases came within the grouping of atrophic arthritis, showing blurring about the lumbosacral facets and bone atrophy. In this group there were 7 cases showing congenital defects. Four cases showed definite changes through the articular facets, such as a slipping or displacement. There were 8 cases showing a markedly horizontal sacrum, which is a source of lumbosacral pain. Six of the cases showed x-ray changes through the lumbar spine, and 5 showed x-ray changes through one or more sacro-iliac joints, with pain referred to the lumbosacral joint.

It is always interesting to note the congenital anomalies through the low back. In the review of these patients there are 47 additional ones to be added to the 243 whose x-rays were examined, but the cases were not used because of incomplete records. In this total number of 290 cases, 40, or approximately 14 per cent, showed congenital anomalies, such as spina bifida occulta of the fifth lumbar vertebra or the top of the sacrum, a sixth lumbar vertebra or a sacralization of one or both transverse processes of the last lumbar vertebra. The angle of the sacrum with the lumbar spine was noted, and in all cases where this angle was decreased the condition was recorded as a horizontal sacrum. There were 30 cases, or 10 per cent, presenting this condition in varying degrees. One case of a vertical sacrum was noted. Three cases of true spondylolisthesis of slight degree and one case of reversed spondylolisthesis were observed.

Strumpell-Marie Arthritis.—Before an analysis of the Strumpell-Marie cases is given, a word should be said about this clinical entity. These conditions were first described by Strumpell[4] in 1897, and then by Marie[5] in 1898. The condition is spoken of by the French as "Spondylitis Rhizomelique." It is called "Spondylitis Ossificans Ligamentosa" by Knaggs.[6] It consists primarily of an ossification of the ligaments of the spine (*Fig. 3* and *4*). The anterior common ligaments are said to be the first ones affected, and in order the posterior common ligaments, the ligamenta subflava, the capsular ligaments of the articular processes, the ligaments connecting the ribs with the vertebrae and the supra- and interspinous ligaments. It is thought that trauma to the anterior common ligaments

and infection play a close part in the etiology of the condition. It is said to have its onset most frequently between the ages of 30 and 40 years and to be much more common in men than in women. The x-ray changes are not always evident in the early stages. Gradually there appears between the vertebral bodies and spaces a shadow which deepens in density with the progression of the disease. It has been

Fig. 3 a

Strumpell-Marie arthritis of lumbar spine, showing a rather smooth ossification over the vertebral bodies. It presents the appearance of a liquid osseous substance.

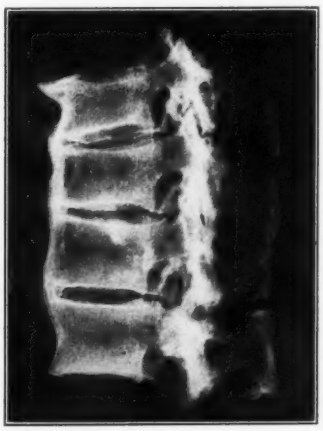

Fig. 3 b

Lateral x-ray of Fig. 3 a, showing ossification of the anterior margins of the vertebrae with relatively normal intervertebral discs.

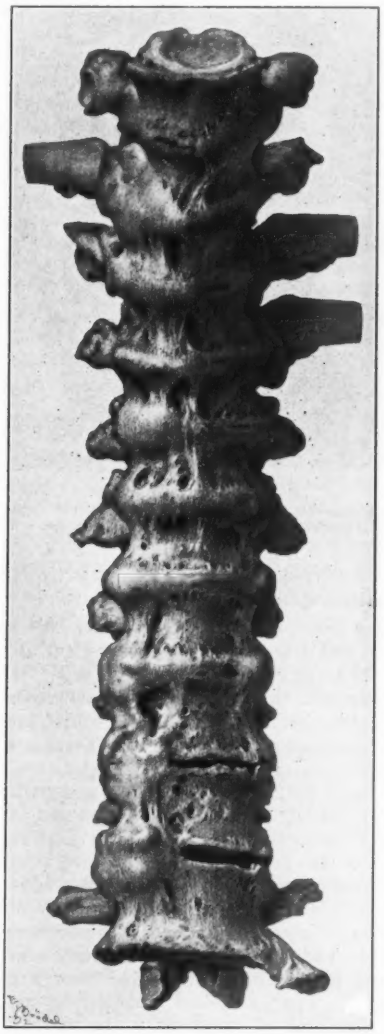

Fig. 4 a

Strumpell-Marie arthritis of the lower dorsal and lumbar spines, showing irregular but smooth bone formation over and between the vertebral bodies. There are, however, many areas of lipping and spurring in the lower vertebrae which resemble typical hypertrophic arthritic changes.

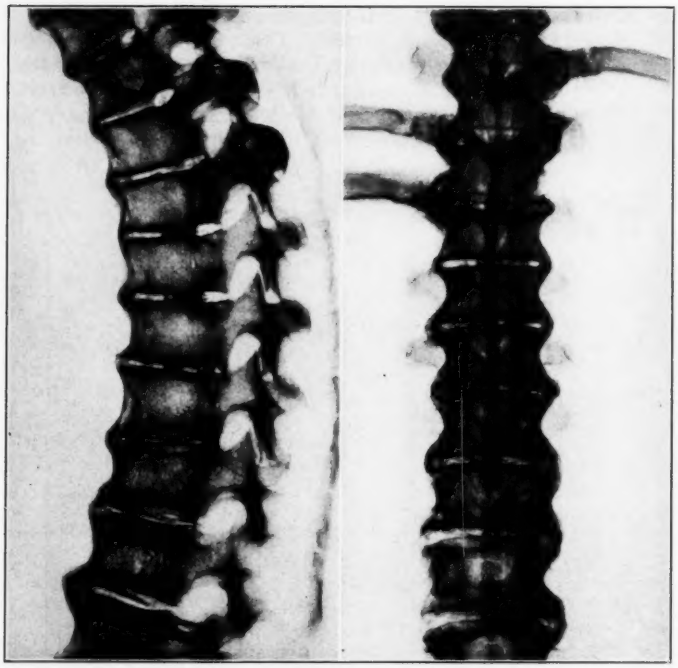

Fig. 4 b
Lateral and anterior-posterior x-rays of Fig. 4 a, showing the extensive bridge formation and bone proliferation about the anterior and lateral aspects of the vertebrae.

placed by Knaggs,[6] Steindler[2] and Llewellyn[7] in the classification of atrophic arthritis.

There were 16 cases observed in this series, 13 men and 3 women. The average age at onset was 23.6 years. This age at onset is considerably less than that reported by Steindler,[2] who states that the period of most frequent occurrence is between 30 and 40. Trauma as an etiological factor was recorded in only two cases, or 12.5 per cent. There was only one patient in whom a definite gonorrheal infection was proved. Knaggs[6] believes that as knowledge accumulates a form of this condition may be found associated with gonorrhea. The belief that it is associated constantly with gonorrhea is incorrect and it is very much over emphasized. There were two men who had not suffered pain at any time, but stiffness had gradually appeared over a period of years. Ten cases had constant severe pain from the time of onset until the time of examination. All of the cases presented marked stiffness and deformity of the spine. Four cases (25 per cent) had clinical evidence of involvement of the hips, whereas, there were 8 cases (50 per cent) which showed involvement of the hips by x-ray examination. One of the younger patients, age 23, showed only very slight x-ray evidence of bone changes. The others, with the exception of two, showed rather marked x-ray evidence of ossification between the vertebral bodies. Three of the cases apparently had radiation of pain into the hips or legs. Steindler[2] has described a chronic ankylosing arthritis of the atrophic type. It is perhaps possible that some of the cases included here should be put under this separate classification.

Von Bechterew's Spine.—This condition was first described by von Bechterew[8] in 1892. It has been classified by Steindler[2] as a hypertrophic arthritis, by Knaggs[6] under a separate classification, and by Llewellyn[7] under atrophic arthritis. There are usually definite hypertrophic changes so that Steindler's[2] classification should probably be accepted. This condition has been spoken of by the French as "La Cyphose Heredotraumatique," and by Knaggs[6] as "Spondylitis Muscularis." It is characterized by a gradual increase in kyphosis and immobility through the dorsal spine. There is a gradual decrease and feebleness in the muscle tone. A conscious feeling of weakness occurs in the back, with some aching pain in the region of the curvature of the spine, especially after exercise. There is said to be a paretic condition of the muscles of the trunk connecting the extremities with slight atrophy of the muscles of the back and those about the scapulae. A definite diminution in the sensibility of the areas of the dorsal, lower cervical and sometimes lumbar nerves appears. Occasionally the motor nerves may show signs of irritation, evidenced by muscle twitching and contractures. It is characterized by the absence of pain and tenderness. There is thought to be an hereditary factor in this condition and that trauma and strain play a definite part. Infectious agents are seldom mentioned as etiological factors. The x-ray changes are

usually atrophic disturbances in the intervertebral discs, with evidence of lipping and spurring about the vertebral margins. The condition usually comes on late in life.

There was only one case of von Bechterew's spine observed, this being in a man of 62. He had had a progressive lesion following trauma for a period of 34 years. The pain had continued more or less over this period of time. There was considerable stiffness with kyphosis through the upper dorsal spine and a tremendous amount of muscle atrophy. The x-ray changes showed a complete calcification of the upper dorsal intervertebral discs extending down to the mid and low dorsal areas. There was bridging of the lower dorsal intervertebral spaces and those of the lumbar spine to a slight degree, but no sharp spurring or lipping were seen. There may be some doubt as to the inclusion of this case in this classification, but it is believed that the clinical and x-ray appearances coincide with the description.

SUMMARY

(1) In a review of 668 cases in the Duke Hospital, in which x-rays of the spine were required, there were 243, or 36.4 per cent, of the cases showing an arthritis of the spine.

(2) A classification of these cases by x-ray and clinical findings showed 67.4 per cent to be in the hypertrophic group, and 32.1 per cent to be in the atrophic group.

(3) There were 57.6 per cent men and 42.4 per cent women.

(4) These patients have been analyzed according to the area of the spine involved. The average age at onset of the sacro-iliac and lumbosacral cases is 33 years; of the dorsal and lumbar spines 42 years, and of the cervical spines 46 years.

(5) Trauma as an etiological factor was reported in 40 per cent of the sacro-iliac and lumbosacral cases, and in 23 per cent of the other areas of the spine.

(6) Radiation of pain is found to be more common in the sacro-iliacs and cervical spines, and less common in the dorsal spine.

(7) A correlation has been made of the symptoms with the signs. In the lumbar spine and in the sacro-iliac and lumbosacral areas symptoms more nearly equal the signs, and in the cervical spine symptoms are more often present without signs.

(8) A correlation of the x-ray changes with the signs and symptoms has been made.

(9) A separate analysis has been made of 16 Strumpell-Marie cases and of one von Bechterew case.

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DISCUSSION (*Abstract*)

Dr. J. Albert Key, St. Louis, Mo.—It has been my observation that true atrophic arthritis rarely affects the spine and that rhizomelic spondylitis is a condition which differs from true atrophic arthritis, in that ossification of the intervertebral ligaments occurs relatively early. Hypertrophic arthritis I consider almost physiological in the heavy type of individual past middle life. I do not pay much attention to hypertrophic changes in the roentgenogram of the spine unless the patient is having symptoms. I imagine that hypertrophic changes are present in 50 per cent of the persons in this room.

BONE METASTASES FROM CARCINOMA OF THE PROSTATE*

By Wm. K. Kalbfleisch, M.D.,
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Ordinarily the roentgenologist expects to find pure destruction in a case of bone metastasis from cancer. In such a case, which I examined in May, 1929, the clinical diagnosis was carcinoma of the prostate. X-ray of the pelvis revealed areas of decreased bone density in the left ileum, in the sacrum, and in the neck, greater and lesser trochanters of the right femur. In these areas the bone seemed to be fading out of the picture. There was no doubt as to the diagnosis: metastatic carcinoma, involving the sacrum, the left ileum, and the right femur.

A few days later the following case came under my observation:

A man consulted our urologist because of prostatic trouble. The examination revealed a large prostate, of second degree firmness, with an area of somewhat firmer consistency in the right lateral lobe. A flat film of the kidney and bladder regions showed no calculi and no bone lesions, except for a markedly increased density of the entire body of the fourth lumbar vertebra. As

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*From the Department of Roentgenology, Wheeling Clinic.

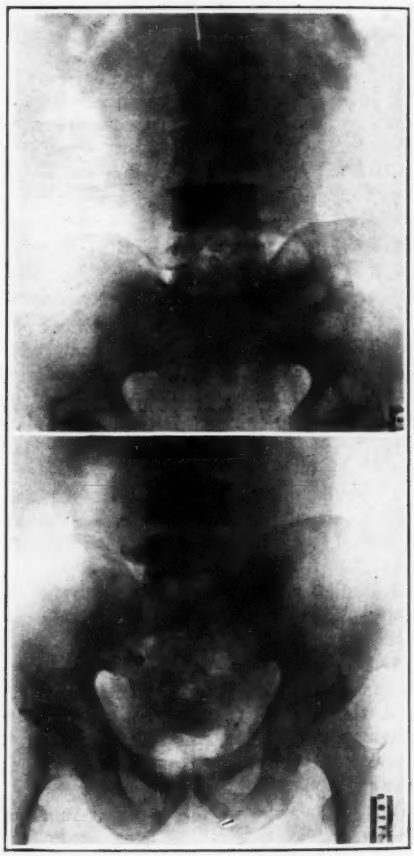
Fig. 1, Case 1
Bone destruction in the left ileum, sacrum, neck and trochanters of the right femur.

there were no other signs of metastasis, this finding was considered to be due to osteitis of this vertebra, especially since the patient stated that he had had an old injury to the spine. After due preparation the patient had a prostatectomy. The postoperative diagnosis of the pathologist was benign prostatic hypertrophy and hyperplasia of the prostate.

About half a year after the otherwise successful operation, the patient began to complain of considerable discomfort in the lumbar and sacral regions. In July, 1929, fifteen months after the first examination, the patient was in very poor health. He had lost some fifty pounds in weight and complained of severe pain in the back, left hip and the entire left lower extremity. Examination revealed no evidence of any mass in the prostatic bed. No lymph nodes were palpable. A radiogram of the patient's pelvis and lower lumbar spine showed no osseous changes in the pelvic bones or in the femora, but a markedly increased density, with loss of all bone detail in the four lower lumbar vertebrae. There were, however, no changes in the size or shape of the vertebrae or in the height of the intervertebral discs.

There could be no doubt that we were dealing with something more than a mere osteitis of the spine. A diagnosis of metastatic carcinoma had to be made. Unfortunately, it was now too late to do anything for the patient, who died three months later. The roentgenological finding in the spine was pathognomonic of a metastasis from cancer of the prostate. Furthermore, the hard nodule which the urologist palpated in the prostate at the time of the first examination should have given us an additional clue as to the real pathology, in spite of the negative microscopic findings reported by the pathologist.

The third case is that of a man 59 years old, who was operated upon August 1, 1929, for hypertrophy of the prostate. A radiogram of the spine and pelvis, taken during the course of his preoperative study, showed no pathological changes whatsoever. The operation, transvesical prostatectomy, was very successful in relieving the patient's symptoms. The patho'ogical report of the specimen was benign prostatic hypertrophy. After the operation the patient felt very well until March, 1931, when he began to complain of vague pains in the lower sacral and lumbar regions. By June, his general health had failed considerably and the rectal examination showed a large, well-fixed mass, with an irregular and nodular surface, in the prostatic area. There was no urinary retention, but the patient complained of severe pains in his back and legs and also in the shoulders and upper extremities. The roentgenological examination made on June 9, 1931, revealed that all of the dorsal and lumbar vertebrae showed markedly increased density, with complete loss of bone structure. However, there were no changes in the size and shape of the bodies of the vertebrae or in the height of the intervertebral discs. The pelvic bones showed the same increase in density, with some mottling in the ileum on both sides. The heads of both femora showed no changes, but both shafts showed round bone defects surrounded by dense



Top—Fig. 2, Case 2
Markedly increased density with loss of bone detail of the fourth lumbar vertebra.

Bottom—Fig. 3, Case 2
Markedly increased density with loss of bone detail in the four lower lumbar vertebrae.

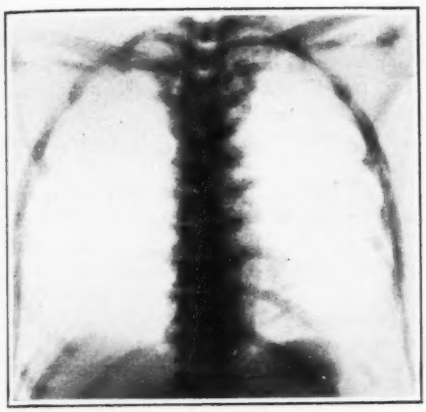
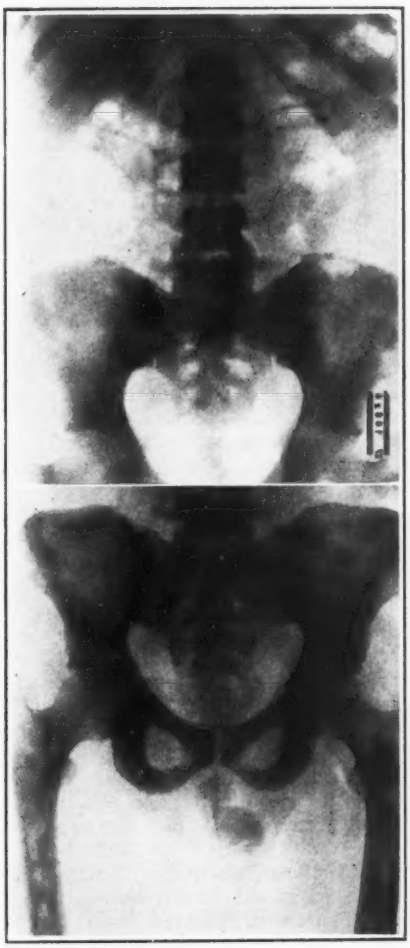


Fig. 4, Case 3
Markedly increased density with loss of all bone detail in the bodies of all dorsal vertebrae.

walls. Some of the areas of increased illumination showed denser centers. Both clavicles, scapulae and humeri showed smaller areas of increased illumination, more or less surrounded by denser walls. In the lung fields and the mediastinum there was no evidence of metastases, but the ribs showed markedly increased density, with loss of bone detail.

There could be no doubt that we were dealing with multiple bone metastases from a malignant tumor, although again the histological report of the specimen removed at the time of the operation was benign prostatic hypertrophy. The local reappearance of a nodular tumor at the site of the operation in itself was sufficient to change the first diagnosis. Now the radiograms showed the unfortunate extent of the metastases, which had spread beyond any hope of successful treatment.

The question arises: is postoperative roentgen treatment indicated in malignant prostatic disease, and if it is already recognized that the tumor has metastasized, can we retard the spread and growth of the metastases by such treatment? A few days ago it was my privilege to hear Dean Lewis, of Johns Hopkins Hospital, discuss the treatment of cancer of the breast before my local County Medical Society. He was very, very skeptical as to the value of any postoperative roentgen treatment in cases of cancer. I cannot say whether or not we could have prevented the local recurrence of the tumor and the metastases in this last case if we had instituted high tension x-ray treatment through the pelvis soon after the operation. Only by a comparison of the outcome of large series of cases, with and without sufficient postoperative roentgen or radium therapy, could such a question be answered. In the meantime, until our knowledge is more complete, if an hypertrophied prostate suggests, or has been recognized as a malignant tumor, high tension x-ray therapy should be started over the site of the tumor and adjacent pelvic regions soon after the operation. Pains should be taken to bring by cross fire as much radiation to the affected area as is possible, without damaging the bladder or rectum. If bone metastases are discovered, they should also receive the same energetic treatment. I do not believe that we can cure a scirrhous



Top—Fig. 5, Case 3
Markedly increased density with loss of all bone detail in the bodies of all lumbar vertebrae.

Bottom—Fig. 6, Case 3
Markedly increased density with loss of bone detail in the pelvic bones and dense mottling in the femora.

carcinoma or its metastases by the rays, but we may be able to retard its further development. Unfortunately, all three cases reported were too far advanced when recognized and no treatment was given.

Carcinoma of the breast, thyroid gland and ovaries, as well as malignant tumors of the kidneys and suprarenals, frequently metastasize to bone. By far the largest number of osseous metastases are secondary to carcinoma of the prostate. According to Simpson,[1] there are as many bone metastases from cancer of the prostate as there are from all other types of cancer combined. There is little variation in the opinion as to how often carcinoma of the prostate shows bone metastases. Blumer[2] states that two-thirds of such cases will ultimately show metastases. Kaufman[3] found an incidence of 72 per cent and Bumpus[4 5] proved, by roentgen rays, bone metastases in one-third of his cases. The bones which exhibit metastases most frequently are the pelvis, vertebrae and femora.

In 2 of 16 cases examined by Kaufman[3] the bone metastases of carcinoma of the prostate showed the ordinary picture of pure bone destruction. In 14 cases, however, the metastases showed the peculiar picture which was first described in 1891 by von Recklinghausen[6] in his paper, "Fibrous or Deforming Osteitis, Osteomalacia and Osteoplastic Carcinosis in Their Mutual Relations." Recklinghausen's studies on osteoplastic carcinosis were based on the necropsy findings in 5 cases of primary scirrhous carcinoma of the prostate, with bone metastases. Macroscopically, the bones showed no deformity and no destruction. On the contrary, the involved parts were very firm. Microscopic examination showed many large, newly-formed bone trabeculae, whereas old bone was undergoing slow absorption. The new bone was found to surround nests of columnar carcinoma cells of the same type as were seen in the primary tumor of the prostate. This occurrence of newly formed bone trabeculae Recklinghausen considered to be too frequent to be a mere coincidental hypertrophic osteitis. It was proven by him to be a pathological entity, a reaction of the body to the presence of miliary scirrhous carcinoma cells. Because of these bone-forming tendencies he suggested the name "osteoplastic carcinosis."

Corresponding to the pathological findings, the radiograms of the affected bones show, in some places, small areas of increased illumination, surrounded by very dense structureless new bone substance. The metastases seem to be more or less encapsulated in a calcium wall. The production of new bone is found at the junction of the tumor and the normal bone; in other words, at the point of stimulation. In other cases, especially when seen early, there are areas of markedly increased density, with complete loss of bone detail throughout, in which no gross bone defects can be demonstrated. This is apparently due to the presence of miliary metastases, too small to be recognized on the film, but sufficient to produce the typical bone reaction (Baetjer and Waters[7]). The radiographic appearance of markedly increased density, with loss of bone structure, but without interference with the size and shape of a bone, located in the vertebrae, pelvis, femora, and, in later stages, in clavicles, scapulae, humeri and also in the ribs, must, therefore, be considered pathognomonic for metastatic carcinoma from a primary scirrhus in the prostate or, when the patient is a female, in the breast (Roccia,[8] Ewing[9]).

An interesting question can be raised in connection with the cases reported. How does it occur that in some cases of prostatic carcinoma the metastases show simple bone destruction, whereas in others we have marked bone production? The answer is that it depends upon the character of the primary tumor, whether it is medullary or scirrhous carcinoma. Recklinghausen directed attention to the fact that in his cases he found nests of columnar carcinoma cells in the metastases of the same type as in the primary scirrhous carcinoma of the prostate. It is logical to conclude that, in the presence of a scirrhous carcinoma, the slowly growing metastatic cells, by mere irritation, cause the proliferation of endosteal connective tissue, which has natural bone-forming tendencies, and results in the dense bone shadows we see in the x-ray pictures. The same pathological changes are found in cases of bone metastases from scirrhous carcinoma of the breast (Roccia,[8] Ewing[9]). If the primary tumor of the prostate is medullary carcinoma, the cell character of the metastases also is different. The tumor grows faster and there are no bone-forming tendencies. There is no apparent attempt to wall off the metastases and, consequently, all that we see in the radiograms of the affected bones are areas of pure bone destruction. It may, therefore, be possible to conclude from the x-ray findings alone whether we deal with a primary scirrhous or a primary medullary carcinoma of the prostate (Stewart[10]).

CONCLUSIONS

All cases of hypertrophy of the prostate should have radiograms of the spine and pelvis before medical or surgical treatment is instituted.

In the presence of prostatic hypertrophy, areas of increased density in the vertebrae or pelvic bones are to be considered carcinoma metastases, even if the malignant primary tumor in the prostate is not detected at the time of the operation.

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DISCUSSION (*Abstract*)

Dr. A. C. Christie, Washington, D. C.—It has been known for a long time that malignant metastases assume the characteristics of the original growth. If the latter is of the medullary type, the secondary growths will produce a destructive or osteoclastic process in bone; if, on the other hand, the primary growth is of the scirrhous type with predomination of the stroma, the metastases to bone are of the condensing or osteoplastic form. Most prostatic carcinomas are of the scirrhous type and their bone metastases, therefore, produce areas of increased density.

As Dr. Kalbfleisch has pointed out, the bone changes are often the first demonstrable evidence of the nature of the patient's trouble. Examination of the prostate is often negative, and even the pathological findings after removal of the gland may be doubtful. The chief value of x-ray examination is, therefore, to enable the patient to avoid unnecessary radical treatment directed at the primary disease and to enable the radiologist to begin palliative x-ray treatment for relief of pain and to delay the progress of the disease.

A word should be said in regard to differential diagnosis of secondary bone lesions from prostatic carcinoma. The condition most likely to be confused with it is Paget's disease. It is sometimes impossible to distinguish these two conditions by the appearances present in the bones of the spine and pelvis. A diagnosis of Paget's disease can sometimes be established when the characteristic bone changes are discovered in the skull in addition to those found in the pelvis. The other bone condition likely to be mistaken for prostatic metastases is that which accompanies parathyroid disease. Indeed, it seems quite certain now that Paget's disease is itself one of the parathyroid group. There are other changes in bone, however, attributable to the parathyroids which are not typically Paget's disease and which must be distinguished from carcinoma arising in the prostate. The most certain method of doing this is by observing the changes which take place in parathyroid disease of bones following x-ray therapy over the parathyroid region.

X-ray therapy over the spine and pelvis will often relieve pain, but its influence upon the disease is only palliative. There is, therefore, no object in giving massive doses with hope of securing a cure. It is impossible here to go into the question of radiation therapy of prostatic carcinoma. I am inclined to agree with Dr. Lewis' opinion, mentioned by Dr. Kalbfleisch, that postoperative radiation is of little or no value. Radiation will undoubtedly have an increasingly important place in treatment of prostatic carcinoma, but not as a means to be employed subsequent to operation. The percentage of cures following prostatectomy for carcinoma of the prostate is so small that surgical treatment of this disease offers practically no hope. There has already been some improvement in the percentage of cures by radium treatment. Further improvement may be expected as our methods of application are perfected. The rectal and urethral routes have now been practically abandoned and there are strong objections to implanting radium through the perineal skin or through the mucous membrane of the bladder after cystostomy. The method which is now coming into use is that of Cade, in which radium needles are carefully implanted throughout the gland through an adequate perineal incision. This method offers hope for real improvement in the treatment of an otherwise almost hopeless disease.

Dr. Franklin B. Bogart, Chattanooga, Tenn.—The frequency of bone metastases in carcinoma of the prostate, the almost universal involvement of the pelvic bones, the lumbar spine and the femurs, and the early stage of the disease at which these metastases to bone frequently occur, give an x-ray examination considerable diagnostic as well as prognostic value. The two types of metastases which Dr. Kalbfleisch discussed have been repeatedly described in the roentgen literature, and Simpson (*American Journal of Roentgenology*, pp. 534-541, 1926) reported a case of carcinoma of the prostate in which widespread metastasis of carcinoma cells to bone occurred without any changes that were demonstrable on the x-ray film. While such cases are rare, the fact that they can occur should make the radiologists and urologists cautious in giving a favorable prognosis even when there is no radiographic evidence of bone metastasis. This fact also brings up the question of desirability of routine radiation of the bones of the pelvis, lower spine and thighs after the removal of a malignant prostate. Personally, I feel that this should always be done.

Paget's disease is not infrequently confused with metastatic carcinoma. In a well advanced case of Paget's disease, where there is extensive involvement of the bones of the lower spine, pelvis and upper thighs with the resulting change in the size and shape of these bones, a correct diagnosis is not usually difficult. When there is doubt, a film of the skull will usually decide the question. In cases of very early Paget's disease, particularly when the age of the patient is between 40

and 50 years, the bone changes occurring in the femurs and pelvis consist of areas of increased density, usually laid down in parallel lines, without any changes in the size and shape of the bones. At this stage of Paget's disease the skull often does not show changes that can be recognized roentgenographically. Such early bone changes in Paget's disease are usually associated with pain and are frequently not recognized by the radiologists. When they are seen they should not be mistaken for metastases.

In outlining the radiation treatment which these cases should receive it is well to recognize the fact that in most of them a cure cannot be expected. Sufficient radiation should be given to relieve pain and to palliate. Attempts at curative doses should be avoided, as the sequelae are apt to be as distressing to the patient during their short remaining period of life as the distress caused by the disease itself.

GLAUCOMA: COMPLICATION OF HYPERMATURE CATARACT*

By RAY K. DAILY, M.D., F.A.C.S.,
Houston, Tex.

In 1892, Mitvalsky,[1] in an article on the spontaneous resorption of senile hypermature cataracts, called attention to the frequency of glaucomatous attacks in such cases. In 18 cases which he collected from the literature 6 were complicated by glaucoma. He claimed that when a Morgagnian cataract has been complicated by glaucoma, it is certain that the fluid portion of the lens has begun to absorb. He was not aware of any etiological relation between the stage of the cataract and the rise of tension. Reuss,[2] in 1900, also emphasized the frequency of uveitis and glaucoma in eyes with hypermature cataract. He sensed that there must be some relation between these complications and the spontaneous absorption of the liquefied lens masses, although he could not demonstrate it.

In the same year Gifford,[3] in reporting several cases of this type, stated that he believed that the glaucoma was a result of the hypermaturity of the lens; at that time he attributed the rise of tension to an irritation of the ciliary processes, caused mechanically by traction of the loose nucleus.

Verrey,[4] in a study of this subject in 1916, stated that spontaneous resorption of hypermature cataract is preceded in the large majority of cases by inflammatory phenomena, and he considered the resorption the consequence of the inflammatory phenomena which precede or accompany the development of the cataract. He believes that the disease penetrates the capsule and sets up a phakitis with swelling and high tension; then comes liquefaction of the crystalline fibers, more or less complete absorption of the nucleus, and in fortunate cases rupture of the capsule with a black pupil, and vision never above one-sixth of normal. In 1918, Gifford,[5] in a second article on the subject, changed his opinion and ascribed the rise of tension to the transudation of toxins liberated by the disintegration of the lens and the blocking of the filtration angle by lens substance. In discussing this paper, Feingold rejected Gifford's hypothesis and held to the belief that the rise of tension in these cases can be explained only by the irritation of the ciliary processes caused by the traction of the shrunken nucleus. In 1927, Knapp,[6] reporting two cases, still held to the theory of mechanical irritation. As yet the etiology of this condition has not been established on anatomical grounds. In spite of the fact that practically all the writers on the subject agree that attacks of congestive glaucoma in eyes with hypermature cataract are hard to treat, and the results are usually unsatisfactory, most of us are still unaware of this disagreeable complication which lurks in hypermature cataracts. There are still ophthalmologists who believe that a unilateral cataract may be left unoperated upon indefinitely with impunity, and that after one successful cataract extraction the other eye may be left alone until something goes wrong with the first one.

I am reporting two cases of this type, because they impressed me with the fact that a hypermature cataract may lead to loss of vision, and because the histological findings in these cases contribute to our knowledge of the etiology of this condition.

Mr. J. P., 83 years of age. The family and previous history are irrelevant. I extracted an immature cataract from his left eye in October, 1922; he made an uneventful recovery and obtained good vision. The right eye at that time had an immature cataract, with vision of counting fingers at 2 feet. I did not see him again until nine years later, when he returned in November, 1931, with the history of severe pain in the right eye for 2 months. The eye had no light perception. The eyeball was intensely congested, the cornea cloudy, the anterior chamber deep, and tension 70 (McLean). Neither myotics, paracentesis of the anterior chamber nor glaucosan had any lasting effect on the tension, and he remained in severe pain. After two weeks of unsuccessful efforts to relieve the pain and reduce the tension, he consented to have the eye enucleated. This was done un-

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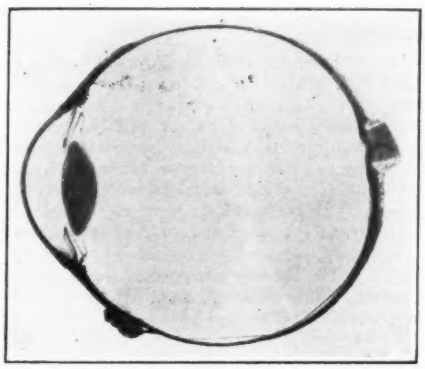

Fig. 1
Microphotograph of enucleated eye of Case 1.

der local anesthesia. The histopathological diagnosis at the Army Medical Museum is as follows:

"Hypermature cataract with spontaneous rupture of the capsule; acute vasomotor reaction throughout the eye; secondary glaucoma."

The microphotograph (*Fig. 1*) shows: irregular edema of the cornea; the filtration angle filled with large, degenerated phagocytes and serum; phagocytes scattered along the anterior surface of the iris and in the posterior chamber; a cataractous lens, with degeneration of the capsule, which has retracted from the lens necleus; considerable fibrin in the ciliary processes; engorgement of the retinal vessels, and marked dilatation of the central vein; some decrease in the ganglion cells in the retina.

This case supports Gifford's view that products of the degenerated lens, and not traction on the ciliary body, are the cause of glaucoma secondary to hypermature cataract.

The second case is H. K. K., 30 years of age. His family and previous history are irrelevant. He came in December 24, 1929, complaining of impairment of vision in the right eye. Three weeks previously a piece of steel struck his eye while he was working on a tool machine. He was sent to the ophthalmologist handling the compensation insurance work, who assured him that the injury was of a minor nature and would be of no consequence. When he continued to complain of impairment of vision a roentgenogram was taken and was reported negative for a foreign body. When I saw him his vision in the right eye was 20/40 corrected to 20/30. The left eye was normal. There was no evidence of injury. The eyeball was entirely free of any inflammatory signs; no scar could be demonstrated. The cornea was perfectly clear, the iris normal. The slit-lamp showed a rosette shaped opacity in the most anterior layers of the lens under the capsule and the capsule was vesicular. In the center of the lens was a wedge-shaped glistening foreign body, which was also visible with a plus 20 lens in the ophthalmoscope. We took another roentgenogram; it also failed to demonstrate a foreign body. With the lens picture, however, I made the diagnosis of a foreign body in the lens, too small to be demonstrated by x-ray. This caused a complication with the employment insurance company, and while the negotiations for a settlement were going on his vision was deteriorating. Three months after the injury his vision was 20/50 and five months later the entire lens was opaque.

I saw him several times during the following year and a half, and in November, 1931, I noticed that his anterior chamber deepened. I advised him to have the cataract extracted. He consulted another ophthalmologist, who advised against the removal of a unilateral cataract on the ground that he would not have binocular vision following the operation.

He returned January 11, 1932, with an attack of acute congestive glaucoma. The eye was congested and painful; the cornea was edematous, the anterior chamber was deep; the pupil a dilated oval. The tension was 80 (McLean). I prescribed 1 per cent eserin and gave him 60 million of typhoid vaccine intravenously on the theory that the rise in tension was caused by an irritative process within the eye. He had a moderate reaction and two days later the tension was 50. The corneal epithelium was still edematous. The pain was relieved. Five days later the congestion was gone, the cornea was clear, and tension was 40; in the normal eye the tension was 25. On January 21, ten days after the glaucomatous attack, I decided to attempt an intracapsular extraction, and fortunately succeeded in extracting the lens in the capsule. I did a large peripheral iridectomy, leaving the sphincter intact, to give him a round pupil. The capsule of the lens was thick, and the entire lens was like a soft jelly apparently without any nucleus. The lower portion of the lens was very dark, due to an iron stain. The microscopic picture, made by the Army Medical Museum, shows the iron particles scattered through vacuoles in the lens (*Figs. 2* and *3*). Recovery was uneventful. With plus 11.00 and plus 2.75 at axis 160; the eye has 20/15 vision. Tension measured recently is 35. There is no other evidence of siderosis in the eyeball.

Here is an eye without a nucleus and an intact capsule which developed a congestive glaucoma. This can be explained only by the transudation of some toxic products, irritating the eye. Here are two similar cases: one with a very disastrous and the other with a happy outcome. Their course leads me to the following conclusions:

Fig. 2
Microphotograph of lens with siderosis.

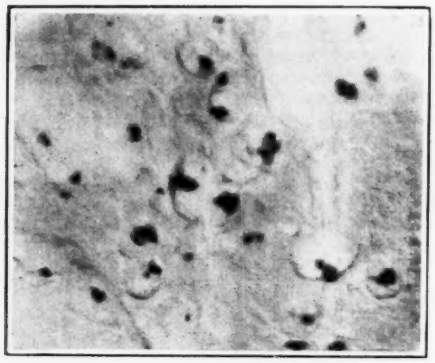

Fig. 3
Magnification showing deposit of iron in vacuole-like areas.

(1) Hypermature cataracts are a menace to the vision of the eye.

(2) Cataracts should be extracted before they reach the hypermature stage.

(3) Glaucoma secondary to hypermature cataract is caused by products of lens degeneration.

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DISCUSSION (*Abstract*)

Dr. C. A. Clapp, Baltimore, Md.—I am very glad to hear Dr. Daily confirm the opinion which I expressed yesterday in the round table discussion on cataracts, namely, that unilateral cataracts, if mature, should be removed: first, because the removal eliminates a blind side which is a danger to life in this rapid-transit age, and second, because a hypermature cataract often produces increased tension or a low grade uveitis. In my discussion of Dr. Knapp's communication, which was mentioned by the essayist, I reported such a case.

In my opinion the increase of tension is probably not the result of any increased pull upon the ciliary processes, but it may quite easily be the result of the increase of cells in the aqueous produced by the low-grade uveitis blocking the filtration angle. If these cases are carefully studied with the corneal microscope, evidences of increased cells are usually found. It is also possible that a biological change in the lens protein may be the cause of the uveitis and of the rise of tension. It is, however, very difficult to make an extensive chemical study of these cataracts because of lack of material.

Dr. R. O. Rychener, Memphis, Tenn.—All of us have doubtless had occasion to assure patients with mature cataracts that extraction could await their own convenience. The cases cited by Dr. Daily and those which I shall describe show that one must be guarded in this advice and it is our duty to recognize the possibility of future trouble in cataracts which may become hypermature. In the past four years my associate, Dr. E. C. Ellett, and I have had to contend with three such cases.

Mrs. C. R. W., age 65, was operated upon elsewhere for cataract of the right eye eight years before with excellent result. The left eye presented a mature cataract at that time, but she was so satisfied with the first eye that she would not consider operation upon the second. On March 1, 1929, the left eye became red and sore, and when she was first seen by us on March 22 the vision was light projection, there was ciliary injection, discoloration of the iris, the tension was elevated to fingers, atropin and hot applications were prescribed. X-ray of the teeth and search for focal infection yielded negative results. March 25 tension in the right eye was 16, left 37 (Schiotz). March 26 intradermal vaccination with 0.04 c. c. 2 per cent lens protein after the method described by Verhoeff was done with a positive reaction within twenty-four hours. Injections of 0.4 c. c. of ox lens protein were given hypodermically on March 27 and April 3. On this latter date tension in the left eye was 18. April 12 a combined extraction in the capsule was done with uneventful convalescence. May 13 vision with glasses was in the right eye 6/6 and Jaeger I, and in the left eye 6/12 and Jaeger III.

The second case, Mrs. W. A. G., age 53, was operated upon elsewhere nine years before. She had not read with her right eye for four years. August 20, 1931, the right eye became red and painful and was treated at home for acute glaucoma. August 26 vision was 1/60, tension 44 (Schiotz), deep ciliary injection, deep chamber, pupil 4 mm. and fixed. Eserin, morphine and ice bags were prescribed. There was no lens protein in the city and desensitization could not be done.

September 4, the tension measured 70 and the eye was very painful. September 5, under local anesthesia, a broadbased iridectomy was done with slow convalescence due to blood in the anterior chamber. September 25, tension was 24, the eye was clear and quiet and there was a fair reflex through the coloboma above the lens nucleus. Extraction later was advised, but has not been done.

The right eye of Mr. R. L. W., age 60, was operated upon for cataract extraction by Dr. Ellett in 1915 with resultant vision with glasses of 6/6 and Jaeger I. July 16, 1932, the left eye became acutely red and painful. July 30, vision was light projection, the eye was injected with a very deep chamber, active pupil of 3 mm., hypermature cataract with a tension of 90+. Eserin, morphine and ice bags were prescribed. The eye became softer and more comfortable and a broad iridectomy was done on July 22 with uneventful convalescence, the tension dropping to 18. Six months later extraction in the capsule was accomplished with ease.

All three cases presented a liquefaction of the lens cortex with a floating nucleus which at times dropped

down in the capsule so as to give the illusion of a dislocation of the entire lens.

These cases are undoubtedly due to an anaphylaxis in the eye because of the transudation through the lens capsule of some lens protein to which the eye has become sensitive. They also illustrate the value of iridectomy alone where desensitization is not feasible, and that the lens may be removed at the same time or later with comparative safety.

Dr. Daily (closing).—It had not occurred to me that glaucoma might be an anaphylactic reaction. The improvement in response to lens protein injection is very interesting. I shall certainly try it should I have an opportunity. I believe that Verhoeff in his paper pointed out that the histopathology of eyes enucleated after what he considers an anaphylactic inflammation is different from the histopathology of eyes enucleated with hypermature cataracts.

The point I hoped to emphasize in this paper is that cataracts may not be left alone indefinitely, and that it is our duty to impress this fact on our patients.

MYOCARDIAL SYPHILIS*

By JACK CLAYTON NORRIS, M.D.,
Atlanta, Ga.

Syphilis of the myocardium is gradually being accepted as a fairly common disease. Eggleston[1] believes that syphilis is the only chronic, specific infection which is a common cause of myocarditis. There are many medical men, however, who hesitate to agree with his opinion. For years pathologists believed the aorta to be the site of the more important pathological changes in syphilis of the vascular system. Careful observation leads me to believe that both the aorta and the myocardium are usually affected. This paper attempts to present certain observations concerning many phases of vascular syphilis with particular emphasis on the myocardial and coronary damage. An effort is also made to illustrate clinical types of the malady and to describe the diagnostic symptoms.

HISTORICAL

In 1754, Giovanni Lancisi[3] described ailments associated with cardiac failure which he believed were caused by syphilis. Ricord[4] commented upon gummata of the heart in 1845. According to Saphir,[5] Lancereaux, in 1866, and Hektoen, in 1894, reported tissue changes in myocardia which they believed to be syphilitic in origin. Lecount, in 1898, observed white circular areas in the myocardium in which the histology was characterized by infiltrating round cells mostly around the arterioles. There also existed areas in which there were leucocytes and necrotic changes. In 1897, Herrick made what was probably the first reference to coronary syphilis. Osler,[6] in 1897, wrote that syphilitic myocarditis appeared either as a diffuse fibroid induration or as a gumma. McKenzie[7] reported heart block caused by gummata in 1908. In 1912, Warthin and Snyder[8] reported 2 cases of congenital syphilis in which spirochetes were found in the heart muscle only. In 1913, Warthin's[9] review of 200 hearts induced him to state that syphilis was the most important factor in causing cardiac disease. While giving the Harvey Lectures, in 1917, Warthin[10] proclaimed his dictum of the modern pathology of syphilis, "based upon the presence of irritative or inflammatory processes usually mild in degree, characterized by lymphatic and plasma cell infiltration in the stroma and about the blood vessels; lymphatic tissue proliferation, eventual fibrosis, atrophy and degeneration of the parenchyma."

Credit for the first accurate gross and histological description of the myocardial changes in syphilis should be given to Hektoen and Lecount. Hektoen's report was four years earlier than Lecount's, and he also first described the association of "oval nucleated cells" which are now considered to be plasma cells.

In 1925, Warthin[11] described "patchy areas within the hearts of a greyish color without hemorrhage," which was one of his last and most important observations.

INCIDENCE AND OCCURRENCE

The disease is more common in the male than in the female, and symptoms occur usually after the thirtieth and before the fiftieth year of age. Young adults, however, are affected and the disease has been observed in infants. Statistics I have reviewed suggest that the disease is more common in some states of North America than in others. Symmers[12] makes no mention of myocardial lesions in a review of 4,880 necropsies; however, he did observe aortic syphilis in 55 per cent of the cases studied. Viko,[13] of Texas, found the disease in 19 per cent of a group of patients. Irvin and White,[14] of Massachusetts, found 40 per cent of a series of infants to have syphilis of the heart and blood vessels. McCollough,[15] of Missouri, reported 458 children of a group of 958 as having myocardial syphilis. Warthin,[16] of Michigan, reported 300 cases of syphilis in which every heart had myocardial disease; and, in 1930,[17] he again observed 66 per cent positive syphilitic hearts out of a group of 169 examined.

In a series of 537 autopsies at Grady Hospital, performed by me, there were 110 in which I found cardiovascular syphilis. Of this group I described 20 hearts as having myocardial changes which I believe to have been caused by *Spirocheta pallida*. In another group of 20 with gross aortic lesions, I also observed syphilitic changes in the myocardium. Collectively, these

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findings suggest the occurrence of myocardial syphilis in more than 20 per cent of the entire group. I believe this to be a low percentage, for I feel that I might have found histological evidence of myocardial damage in more of the series had I made a minute study. I am thus inclined to believe that few hearts escape the disease, especially if the aorta is seriously involved.

McCord,[18] of Georgia, whose studies in congenital syphilis are very informative, told me that he found *Spirocheta pallida* in the heart muscle of 20 per cent of 355 stillborn infants. Virgil E. Simpson[19] states that luetic myocarditis is a common disease, and J. M. Anders[20] claims that the heart is the tissue first involved in syphilis. Cohen,[21] of Wisconsin, writes that syphilis was responsible for 15,000 heart deaths in 1926. Martland,[22] of New Jersey, in his study of aortic disease, in contrast to the opinions of others as quoted above, believes the myocardium to be frequently normal in the disease; he suggests that syphilis does not manifest itself in the myocardium. He further feels that a few spirochetes within the muscle surrounded by lymphocytes, "may mean nothing more than an historical landmark." I cannot agree with his conclusions.

From the preceding reports and opinions are noted great variations in conclusions. As to incidence, we shall consider syphilis of the heart to be a common disease. Concerning geographical distribution of the disease, we shall temporarily understand that the malady occurs most often in Michigan, next in Missouri, and thirdly in Massachusetts, then in Georgia and Texas. Temporary statistics will be changed when pathologists become more interested in and better acquainted with Warthin's modern histological concept of syphilis of the myocardium.

PREDISPOSING FACTORS

After the initial spirochetemia, it is probable that the usual phases of the infection ensue and the spirochetes harbor themselves within various tissues and there remain dormant until some process encourages their attack upon an organ. The heart is usually symptomatically affected seven years following the initial lesion, though the interval may be much shorter.[23a] Any irritating factor that disturbs the heart rate and structure predisposes to syphilitic myocarditis. Among these may be considered alcohol, tobacco, caffeine, certain coal tar derivatives, benzene, gas poisons, anemia, so forth. Hard labor is most important, as is suggested by the occurrence of the disease more often in men of the laboring class, while the women are not affected. Congenital spirochetemia certainly plays a part. The most important factor is the infected aorta. It is probable that with aortic injury there follows a dysfunction of the aortic valves and coronary arteries: thus, a disturbed nutrition with a weakening of the cardiac muscle. Paullin,[23] who does not fully explain the process, suggests that the heart becomes involved because of circulatory interference following aortic damage and narrowing of the coronary ostia, thus producing anemic infarcts. There are others who have a similar opinion. I am inclined to believe that the involvement occurs during a second stage following the anemia infarct and during the process of repair, at which time there occur new forming lymphatics and blood vessels. It should be borne in mind that the early phases of syphilitic inflammation are associated with and dependent upon a sufficient blood supply. It is believed that the spirochetes are largely distributed by the lymphatics. If this be true, then the heart should be a fertile field for their reception because of its numerous vessels of this type. Intercurrent infections and other types of vascular disease certainly predispose to the malady. There is frequently an associated arteriosclerosis and differentiation is not clear. Late spirochetal infections in the adult are vitally important; particularly is this true of the laboring group.

PATHOLOGY

Grossly, the heart is enlarged by hypertrophy. There is usually a definite dilatation of the left ventricle cavity, and the heart wall is thin. The epicardial surfaces usually are red and the peripheral vessels are congested. The right ventricle is distended and the muscle thin and flabby. The cut sections of the muscle will usually present scattered, irregular, greyish areas which vary in size. Occasionally, they are distinct and are easily recognized. They may or may not have a congested periphery, and no evidence of hemorrhagic material is present. The endocardium may be thickened and white. Often the muscle shows a general irregularity of colors: some areas are pale pink, others more red, with interspersing pale grey areas. (Overnight in 10 per cent formalin often makes the picture more discernible.) In the heart of those who have aortic damage, the presence of small irregular-sized hemorrhages is found in the inter-ventricular muscle. The histological sections of these areas show them to be composed of blood cells, which seem to penetrate between

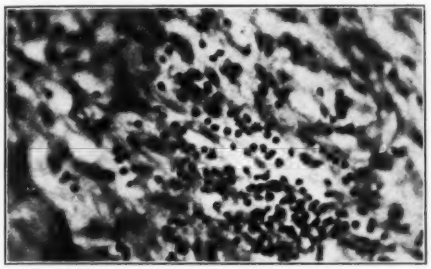

Fig. 1
High power showing numerous infiltrating lymphocytes and other cells.

the muscle fibers. It is possible that this process may be an important factor in myocardial failure by causing a separation of the fibers within an area where important nerve fibers exist, thus giving rise to a serious cardiac arrhythmia.

The atria are often enlarged and dilated, and occasionally streaks of fibrous tissue may be observed.

Gumma may rarely occur and present itself as a nodulated, firm, and resistant mass. The valves, other than the aortic leaflets, are not involved, in my experience. I have never seen the pulmonary artery affected by syphilis, though others have reported such a lesion.

CORONARY ARTERIES

Reports have been made of myocardial syphilis in which it was claimed that little damage was noted in the coronaries. It is my observation that these vessels frequently show damage in the walls of the larger branches and in the smaller arterioles. A summary of my observations is as follows:

(1) Both arteries may be involved extensively, characterized by the presence of longitudinal striation which causes a wrinkling, together with elevated grey-blue edematous plaques which are scattered about in various places. Occasionally, these plaques may have a slight yellow cast and are very firm, but are not necessarily brittle. Dissection into such a vessel wall shows a thickening of all its layers. At times, small hemorrhagic areas may be seen which appear as reddish-brown spots. These hemorrhage areas often press upon the vessel lumen.

(2) The coronaries may further show regions of the vessel wall to be thinned out, and small faint bluish ulcerations may be present.

(3) Only one vessel may have the features described above, while the other shows no evidence of disease.

(4) Not infrequently the larger portions of the coronaries may appear smooth and glistening, and no damage will be seen by gross examination; yet the histological study will reveal collections of round cells about the adventitial blood vessels and the very small arterial ends may be seriously thickened.

(5) Occasionally in the terminal arteries, deep within the muscle, occlusions may occur and a secondary inflammatory reaction ensue, and infiltrating leucocytes may be present. The patient may have had symptoms of a coronary thrombosis.

(6) The more common lesion will be characterized by the changes around the ostia, the openings being narrowed by a puckering, a swelling, and a roughening. These changes often extend only 0.5 to 1 cm. Occasionally a small aneurysm will be found in that region.

(7) In conjunction with the above described changes, atherosclerosis may complicate the lesion, and the microscope will be the only differentiating aid or manner in which one may determine the disease causing the greatest amount of damage.

HISTOLOGY

In myocardial syphilis, the lesions, which I feel to be typical, are characterized by the presence of round cells of the lymphocytic variety and occasional plasma cells which collect around the small blood vessels. They also infiltrate between the muscle fibers, into connective tissue stroma and beneath the endocardium. There is another cell which is constantly encountered which may be of endothelial origin. It is larger than a large monocyte, but smaller than the

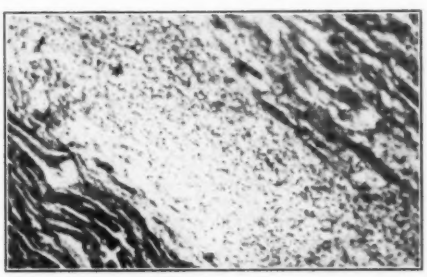

Fig. 2
Low power demonstrating degenerative changes and repair in muscle stroma of heart.

Fig. 3
Low power showing area near coronary ostia. Note thick arterial wall, new vessels and dense area of collected lymphocytes.

typical plasma cell as described by McCallum and Maximow. The cell I have in mind has a round nucleus which takes a deep blue stain, whereas the cytoplasm stains pink-red with hematoxylin eosin stain. Some of my confreres, who have studied this cell with me, are of the opinion that it is a plasma cell which stains atypically. However, my observations of the staining reactions described above have been fairly constant, and I describe this cell so as to bring it to the attention of other pathologists in order that its true derivation may be cleared up. Other important features are new forming blood vessels. The older vessels show endothelial hyperplasia and an intimal thickening.

In a special group of hearts, which I studied to determine the more constant histological features, I found that fibrosis was common. New blood vessels were often numerous. Central necrosis occasionally was observed. In all of this series interstitial fibrosis was present in some degree in 70 per cent of the hearts examined. Hypertrophy of the fibers, cloudy swelling, fragmentation and segmentation, and fiber edema were also constantly observed. The auricles were often involved; these offer a field for future study which should reveal important changes. Beneath the endocardial membrane and between the muscle fibers round cells were often found, and other muscle changes were similar to the changes in the ventricles.

DISCUSSION OF DIFFERENTIAL PATHOLOGY

The syphilitic heart will be confused most often with one damaged by atherosclerosis or rheumatic fever. The sclerotic heart, in patients who have had hypertension or nephritis, is often larger by actual weight and measurement. The left ventricular wall is thick and firm, and dilatation is not so prominent. The muscle is red in color, though the periphery is cyanotic. The patchy grey areas of syphilis are absent. The right ventricle also is dilated, but firm. White, glistening radiations of fibrous tissue are usually prominently seen in the left ventricular muscle. The coronaries may be very firm and tortuous; dissection will often reveal innumerable, almost continuous, yellow plaques. The ostia may be of pin-point dimensions. With extreme atheroma the left ventricular wall may be very thin at a point near the apex, which has resulted from numerous occlusions. The muscle may be almost entirely replaced by fibrous tissue. Within the ventricular cavity intramural thrombi may be present which have formed as a protective mechanism. The coronaries are tortuous to an extreme degree and are very brittle and hard. The coronary damage in sclerosis seems to begin in the terminal arterioles and spread to the larger vessel openings. One gains an impression that in syphilis the reverse procedure may occur.

The rheumatic heart is not so confusing as to differentiation. It is often tremendously enlarged. One removed at necropsy weighed 1,050 grams. The coronaries are not often damaged. The mitral valves are shortened, thickened and stenosed. The aortic leaflets may have thickened, rolled edges.

The syphilitic heart is characterized by the previously given gross and histological descriptions. It seems proper to state that arteriosclerosis and syphilis involving the same myocardium will often make differentiation almost impossible.

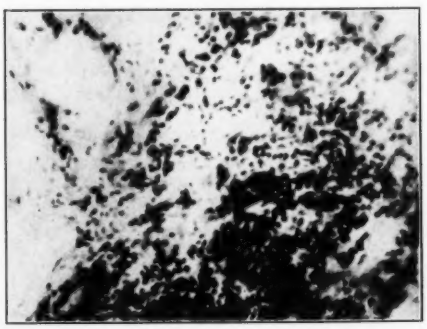

Fig. 4
High power illustrating infiltrating lymphocytes and proliferating fibroblasts collected in an area of muscle.

Fig. 5

Photo of heart with marked infarction. The areas contained innumerable lymphocytes, fibroblasts and occasional plasma cells. Spirochetes were present. This heart has also been described by Dr. J. E. Paullin.

SYMPTOMATOLOGY (EARLY-LATE)

The literature reviewed indicated that there is no accepted early clinical syndrome. Brooks,[24] of New York, states that an irregularity of heart action, especially if under strain, the presence of extra systoles and an occasional tachycardia suggests myocardial damage. Halsey[25a] concludes that syphilis of the heart may indicate its presence only by an insidious, unaccountable inability of the organ to meet the demands of circulation. A moderately enlarged heart with blood pressure not exceeding 145 mm. systolic (usually lower), with the sound very soft, with a mitral systolic murmur and with evidence of slight myocardial deficiency (such as the slightest edema and shortness of breath) is, in my experience, very suggestive of syphilis, particularly if symptoms are not associated with some other recognized focal sepsis.

As the damage to the muscle increases there is noted the more positive enlargement of the heart. There is not infrequently a definite form of cardiac irregularity and a pulse rate increase. Often the pulmonary pressure rises and a respiratory difficulty now becomes very disturbing. Edema is notable.

A later phase occurs in which paroxysmal nocturnal dyspnea is frequent. (The electrocardiogram usually reveals a definite irregularity and suggests a general myocardial weakening.) Pain may occur which is substernal; or pain may be over the left heart wall and may radiate to the left shoulder and down the arms. Adams-Stokes' syndrome, gallop rhythm, fibrillation and extra systoles may be present in various cases. Either heart block or pain should be a warning to the observer that the lesion is very serious and that the damage is extensive and the prognosis grave.

According to Carter and Baker,[25b]

"Unusual cardiac enlargement, without demonstrable cause in the absence of valvular murmurs, with a moderately diffuse apex thrust, with a first sound at the apex which has lost its clear muscular tone, with but poor filling of the peripheral vessels and a lower systolic blood pressure than one would expect from the degree of enlargement and character of the apex impulse, with a positive blood Wassermann reaction, should suggest syphilitic involvement of the myocardium."

The following cases illustrate many of the features described:

Case 1.—A man of 53 years, well developed and nourished, had noticed for several months that his feet were swollen slightly. He had also observed that he was incapable of his usual activities because of a slight dyspnea and a "skipping heart." After a meal he experienced a sudden severe substernal pain. This he attributed to "indigestion." Following this experience he noted the frequent occurrence of such pain. These pains became severe and later radiated from both arms, and finally he was completely incapacitated. Even walking up a short flight of stairs would provoke an attack of angina.

His blood pressure was 105/90. His pulse was 80 per minute, and was very irregular because of numerous extra systoles. There was a slight enlargement of the heart by percussion. There was a faint systolic murmur over the apex. The heart sounds were soft and distant. All other findings were negative, including x-ray examinations. The Wassermann and Kahn were four plus. The "attacks" of angina were typical, even to the ashy-grey color of the skin, followed by a sweat as the pain disappeared. Fifteen years before the onset he had a chancre which disappeared in a month following the use of calomel powder. He had never taken any antisyphilitic treatment. He died suddenly one morning following an angina attack, eighteen months after the onset of symptoms.

Case 2.—B. R., a man of 56 years, was admitted to the hospital on November 20 complaining of dizziness

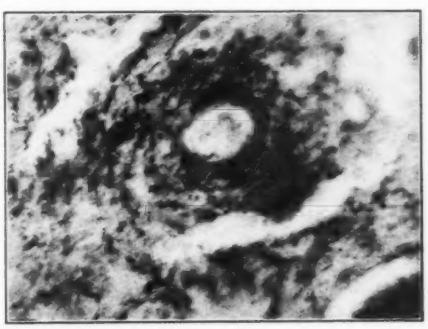

Fig. 6

Oil immersion showing innumerable *Treponema pallida* about the blood vessels of a babe with congenital syphilis. The organisms were also found in the vessel lumen.

and "flooding" of the heart. On the morning of admission he had noticed a sudden skipping of his heart, following which he became dizzy and fainted. He was brought to the hospital, where consciousness returned. He then complained of dyspnea and extreme weakness, pain about his heart and sternum, radiating from the sternum to the lumbar region of his back. The physical examination revealed a well-developed and well-nourished body. The blood pressure recorded 110/65. Respirations were 28 per minute. The heart was slightly enlarged. The pulse rate was 62 per minute at the radials and 112 per minute over the heart. There was an irregular irregularity with missed contraction and extra systoles. For twenty-four hours the dyspnea and pain persisted and later each became more pronounced and the respirations shallow. He died suddenly at 11:00 p. m. December 21. The best information obtainable indicated an illness of less than two years' duration. The autopsy revealed an enlarged heart weighing 610 grams. The epicardial surfaces were reddish in color and the small vessels were distended. There were numerous areas of greyish type. The heart muscle was very soft and flabby. The auricles were distended. The left heart wall was hypertrophic; the cavity dilated. The right heart was very markedly dilated. The cut section of the muscle of the left ventricle showed numerous, greyish, blotchy areas situated well within the endo-myocardium which measured from 2 to 10 mm. in width. The coronaries were distended and the terminal vessels seemed occluded. Dr. J. E. Paullin examined the ostia of these vessels and noted that the right coronary was thickened at the opening with a narrowing of the ostia; the left coronary was negative. The microscopic appearance is illustrative.

Case 3.—E. W., a woman, age 29 years, was admitted to the hospital complaining of shortness of breath with edema of the feet. Four months previously she became dyspneic and had a vague, indefinite pain beneath the sternum. Physical examination revealed a well-nourished woman with edema of extremities. Her blood pressure was 110/90. The heart was enlarged to the left and the sounds were distant and soft. There were no murmurs. The pulse was of poor volume, but fairly regular. She responded to treatment unsatisfactorily and died from an intercurrent infection two months after admission. At autopsy the heart weighed about 400 grams. It was a beefy red color. The peripheral vessels were congested. The cut surface showed an extreme dilatation of the right auricle and ventricle. The left ventricle was distended. The musculature showed remarkable degenerative changes exhibited as whitish-grey, irregular areas of a semi-resistant type. The right coronary had a narrow ostia and was occ'uded at its middle portion. The left coronary was also narrowed.

Case 4.—This patient showed even more characteristic clinical phenomena, illustrating again the Adams-Stokes syndrome. A colored man, age 31 years, was admitted to the hospital on September 3, 1931, and died October 21, 1931. He was complaining of shortness of breath. In November of 1930 he was awakened one morning with a sense of suffocation and was forced to approach a window for more air. Coincident with reaching the window he had a severe precordial pain which radiated to the left manubrium. Almost simultaneous with this pain he became unconscious for about ten minutes. Following the above onset were a train of difficu'ties such as dyspnea on exertion, palpitation of the heart, and finally edema of the feet and ankles and nocturia. In 1921 he had a penile lesion which lasted for a week or more.

Physical examination revealed a well developed negro with extensive edema. He was unable to rest unless his head and thorax were elevated. His temperature was normal. His blood pressure was 130/110. There were no exudates or hemorrhages in the eye grounds. There were a few moist scattered ra'es within the bases of the lungs. The heart area revealed a diffuse apex impulse in the sixth interspace. The left border of dullness extended 14 cm. to the left. The right border of dullness extended 5 cm. Auscultation revealed a musical, blowing, systolic murmur which replaced the first sound. The second sound was barely heard. The systolic murmur increased in intensity, but lost its musical quality as one listened at the base where it was barely audible. At times there was a coupling of the beats and occasional extrasystoles.

The abdomen was edematous. The reflexes were normal. The blood cells were deficient in hemoglobin. The urine contained albumin and a few casts. There was retention of nitrogen and creatinine. The blood carbohydrate was low. The Wassermann was four plus.

On a regime of rest, diet and digitalis he seemed to improve; yet he appeared very weak. He died unexpectedly one morning without pain or serious distress.

The necropsy revealed an hypertrophied and dilated heart. It weighed 640 grams. The muscle was pale and soft. The cut section of the left heart muscle revealed an extensive process characterized by greyish areas which were variable in size and shape. Similar areas were in the inter-ventricular wall. The mitral cavity was lined by a white, tenacious, glistening membrane. The auricles were distended. The coronary vessels were not significantly damaged and the ostia were patulous. There was a light roughness at the aortic base. The valves were not involved.

Sections from this heart were sent to Dr. Weller at Ann Arbor and he reported the presence of lymphocytic infiltration with an endocardial fibrosis, and his diagnosis was that of myocardial syphilis.

DISCUSSION OF SYMPTOMS

The cases presented reveal the symptoms in myocardial syphilis to be very mild in the beginning of the disease. It is evident, however, that the malady quickly progresses to serious stages with a rapid decline in cardiac efficiency. The symptoms are more serious if both the muscle and the aorta are involved. The extent of muscle damage will largely influence the train of cardiac irregularities. Compared with those patients who have hypertensive or sclerotic hearts, it is our impression that the myocardial syphilitics are seldom restored to health and that death usually occurs within a period of two years following the first symptoms. The syphilitic patients seem more ill and are more seriously incapacitated; also, their heart findings and symptoms are more variable and complex. Those patients of the sclerotic groups may have several decompensations with partial restoration

to health, even though coronary occlusions are more frequent. The coronaries in sclerosis are grossly more seriously damaged than are those affected with syphilis, and the essential difference seems governed by the aging process. Why the myocardial syphilitics are greatly incapacitated and difficult to aid medicinally is hard to explain, unless syphilis in tissues is largely infiltration and degeneration with more rapid release of toxins; whereas, sclerosis is a reparative process of fibrosis and calcification without serious toxic principles or much absorption, yet giving rise to an eventual mechanical disturbance which becomes pronounced.

An adequate descriptive summary of myocardial syphilis into symptoms might be as follows: a gradual myocardial failure which quickly reaches its peak and is associated with dyspnea and edema; a variable but dramatic group of clinical phenomena (such as cardiac pain, dilated heart, mitral murmurs, Adams-Stokes' syndrome); and a normal or only slightly elevated blood pressure, in a patient about fifty years of age or usually younger, with death occurring in less than two years after the onset of symptoms.

Ordinarily, these patients die from congestive heart failure or some terminal infection. Those who have aortic involvement may die suddenly and no explanation for death be found other than a dilated heart filled with blood and hemorrhagic areas within the interventricular muscle. Occasionally, there may be a terminal thrombosis, an angina, or a Stokes-Adams syndrome as the cause of death.

TREATMENT

The treatment of myocardial syphilis is yet in the experimental stage. It is well to remember that the condition governing the therapy largely depends upon the individual's age and the symptoms. It is probable that, in the earliest stages of the disease, especially in young adults, arsphenamine would be tolerated with beneficial results. If there are distinctive symptoms of cardiac failure and possible aortic involvement and the age exceeds forty years, then the patient should be placed at absolute rest, the heart strengthened and rested, and mercury and iodides judiciously utilized. Bismuth seems to be of considerable benefit.

It is to be borne in mind that one's result probably will depend upon the gradual destruction of the spirochete, strengthening of the heart, the prevention of the syphilitic cellular reactions and the reparative changes which may be so extensive as to produce a most serious impairment.

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DISCUSSION (*Abstract*)

Dr. Russell H. Oppenheimer, Atlanta, Ga.—Dr. Norris has presented to us a subject which has been the basis of vigorous dispute.

After weighing Dr. Norris' presentation of his pathologic findings one is inclined to believe that much opposition to the formation of any concept of syphilitic involvement of the myocardium is traditional rather than the result of investigation and study. It is characteristic of medical men to hold tenaciously to old ideas and to refute the accuracy of virgin observations. This, on the whole, is a healthy attitude and minimizes the necessity of frequent retraction from changed opinions. Though we have long recognized the predilection of syphilis for the vascular system, we have hesitated to accept the idea of its attacking the heart itself and have assigned circulatory disturbances to syphilitic involvement outside the cardiac tissue.

Dr. Norris has described in the heart hemorrhage, cellular infiltration and tissue changes which correspond

to the changes produced by syphilis in other tissues. This alone is convincing. He has correlated these changes with clinical findings, which make his conclusions logical. Those of us who have had the opportunity of observing large numbers of patients with cardiovascular syphilis have often wondered about the wide divergence in the clinical pictures which they present, the marked difference in their response to therapeutic measures, and the inequality of the term of life which they may enjoy. It is probable that the explanation of such discrepancies may readily be found in the extent to which the heart muscle is involved by the syphilitic process.

Dr. Robert Wilson, Charleston, S. C.—This paper of Dr. Norris' is exceedingly interesting, especially from the viewpoint of the frequency with which he finds syphilitic myocarditis. True syphilitic myocarditis seems to be much less frequent with us. I have been inclined to regard cases of cardiac hypertrophy occurring independently of valvular disease or of hypertensive disease as probably of syphilitic origin in most instances, but I am not able to adduce convincing pathological evidence from our observations in Charleston. In the last thousand consecutive necropsies performed by Dr. K. M. Lynch definite syphilitic myocarditis was found in only two instances, one of which was congenital. There was a considerable number in which the heart showed fibrosis and it is possible that a good many of these may have been syphilitic, but the appearance was not definitive enough to warrant a positive diagnosis. Syphilis of the coronary ostia due to extension from the aorta followed by nutritive degenerative changes in the muscle fibers with consequent fibrosis may afford an explanation of some of these cases; but this is not true syphilitic myocarditis. There is no symptom or group of symptoms referable to the heart which can give any assurance of syphilitic pathogenesis. The symptoms are simply those of a failing heart muscle or of coronary disease; whether of syphilitic etiology can only be surmised.

Dr. Louis Hamman, Baltimore, Md.—It is a pleasure to discuss the topic Dr. Norris has presented because it is one in which I am interested, as indeed are all clinicians, and particularly those from the South. For the clinical manifestations of syphilis are especially prevalent in the negro and physicians who practice in the North and minister exclusively to white patients see only occasionally those symptoms of the infection which daily come to our notice. This, I think, is conspicuously true of the cardiovascular disease that is caused by syphilis. We now all agree that with rare exceptions aneurysm of the aorta is the result of syphilitic aortitis. Nor is there any dispute about the distinctive clinical picture of aortic insufficiency secondary to syphilitic aortitis. We are still searching for satisfactory evidence which will permit us to make the diagnosis of syphilitic aortitis before aneurysm or aortic insufficiency develops. In this search we are meeting with some success, but there is still a wide difference of opinion, some claiming that the diagnosis is relatively easy and may frequently be made with assurance, others that the diagnosis is extraordinarily difficult and may never be made confidently when aneurysm or aortic insufficiency is absent. But the point about which physicians mostly disagree is the incidence and importance of syphilitic disease of the myocardium. Needless to say that Dr. Norris is one of those who think it occurs frequently and is of great importance, whereas I, on the contrary, join with those who think it is rather uncommon and seldom of great clinical importance. When such a wide difference of opinion exists it is reasonable to assume that the difference depends not upon facts, which after all must be well known, but upon the interpretation put upon the facts. And so it is concerning syphilitic myocarditis. Dr. Norris has ably and genially put his side of the question before you. The facts and his interpretation of them need not therefore be rehearsed. I wish to present briefly the opposing view. The argument must be drawn from clinical and pathological observations. I should prefer to begin with the clinical evidence, but I think the matter may be more directly and clearly exposed by beginning with the pathological evidence. Here the crux of the matter is the interpretation put upon the lesions Dr. Norris has illustrated with his slides. Dr. Norris and other pathologists with him say these lesions are definitely syphilitic; other equally eminent pathologists say they may be syphilitic, but there is no proof that they are, and since lesions indistinguishable from these are often found in the heart when there is no reasonable suspicion of syphilis, they refuse to label as undoubtedly syphilitic lesions which have no characteristic marks by which they may be unquestionably identified. In Baltimore Dr. MacCallum and his associates insist upon this conservative attitude and in this respect the clinicians are willing to go hand in hand with them. The dispute is an old one. It was begun by the startling contentions of Warthin. Working at Ann Arbor, where the positive Wassermann incidence among the hospital clientele was 6 per cent, he found what to him was convincing evidence of syphilitic disease in the hearts of 40 per cent of all who came to autopsy. The evidence consisted of finding in the tissues spirochetes and histological lesions which he considered distinctive of syphilitic disease, in a large proportion of these cases and the finding of spirochetes in so large a number was the important basis for the conclusion that the histological changes were specifically syphilitic. No pathologist, excepting perhaps those trained under Warthin, has been able to demonstrate spirochetes in the heart muscle except very, very rarely and under most unusual circumstances, not even in hearts when it can be reasonably assumed that the changes there found are syphilitic. I would not have you infer that this failure to corroborate Warthin's findings necessarily means that they are wrong, but only that judgment must be temporarily suspended and that during this interim doubt may be expressed without giving offense. I have already pointed out that pathologists do not unanimously agree to accept the histological changes Warthin describes and illustrates as absolutely distinctive of syphilis. Until pathologists can reconcile their differences and come to some satisfactory conclusion about these matters, surely clinicians are justified in entertaining skepticism. Aside from these considerations attention may be called to the violence Warthin's claims did to our seemingly well founded clinical impressions. The Wassermann test, we

felt, was sufficiently searching, but its revelations, we were now asked to believe, exposed only a small portion of those contaminated by syphilis. Is it indeed possible that 40 per cent of the population is infected? The conclusion is incredible.

If now we turn to the clinical evidence, I must state that in my experience the circumstances justifying a diagnosis of syphilitic myocarditis seldom arise. We have looked warily for such evidence, especially during the past five or six years, and in this period have found only four or five instances in which the facts seemed reasonably to justify the diagnosis. I speak now not of small areas of infiltration discovered microscopically, but only of extensive myocardial damage which seriously impairs the function of the heart. In association with syphilitic aortitis small areas of infiltration almost regularly are found in the heart. These may be syphilitic, I doubt not that they are, but this does not now concern us. The point I emphasize is that such small areas of infiltration do not impair the cardiac function and therefore give no characteristic signs by which they may be recognized during life. It is notorious how slight are the symptoms of luetic aortitis until aneurysm or aortic insufficiency appears. Heart failure with aortic insufficiency is satisfactorily explained otherwise and we may be sure that small areas of myocardial infiltration, be they syphilitic or not, contribute little or not at all to the failure. The only circumstances which warrant a clinical diagnosis of syphilitic myocardial disease is heart failure when there is nothing else to explain it but inherent weakness of muscular contraction: that is, when hypertension, valvular lesions, pericardial disease, congenital defects and hypertension in the pulmonary circulation are all excluded. Then we may conclude that the cause of the failure is myocardial disease, but even then we must still exclude the many other and more frequent causes of myocardial disease before we dare diagnose syphilitic myocarditis. Clinicians must insist upon these rigid criteria and I think conservative pathologists will agree to add their insistance.

Dr. John B. Youmans, Nashville, Tenn.—I would like to disagree with one point which Dr. Hamman has raised. Though I have not reviewed Dr. Warthin's publications recently, my experience at the University of Michigan makes me doubt that Dr. Warthin ever made the statement that he had found spirochetes in 40 per cent of patients. What Dr. Warthin did was demonstrate the presence of spirochetes, in association with certain histological changes, in a considerable number of cases. These histological changes he therefore believed to be characteristic of syphilitic lesions and thereafter diagnosed them as such, without, in most cases, attempting to demonstrate the presence of spirochetes.

Dr. Norris (closing).—My findings are in accord with those previously described by Dr. Warthin. The percentage of occurrence is less than the percentage claimed by others, but is higher than the number found in the average clinic. The cases which I have used to illustrate were diagnosed principally on clinical symptoms, positive Wassermann, history of primary infection, the findings of spirochetes in one instance, the cellular changes, and the absence of other etiological factors. In one instance the sections were diagnosed by consulting pathologists.

ROCKY MOUNTAIN SPOTTED FEVER (EASTERN TYPE) IN THE SOUTHERN STATES*

REPORT OF SIX CASES IN TENNESSEE

By WM. LITTERER, A.M., PH.C., M.D.,**
Nashville, Tenn.

Rocky Mountain spotted fever has without doubt existed in Idaho and Montana ever since the first settlements by white men. Scientific study of fevers in the Rocky Mountain region began clinically in 1880, epidemiologically and pathologically in 1902, bacteriologically in 1906, immunologically in 1908, and preventively in 1911. Although at first variously diagnosed as black fever, blue disease, black measles, eruptive typhoid fever, cerebrospinal meningitis, typhus fever, dengue fever, and so on, from 1880 to 1895, to the more observant physicians practicing in the heavily infested areas, it became apparent that they were dealing with a new clinical entity. The work of Ricketts and associates from 1906 to 1911 contributed immeasurably to a knowledge of the virus, the factors of transmission, the immunological reactions and the morbid anatomy of the disease. Wolback, in 1918, added valuable pathological and bacteriological data. Spencer and Parker have introduced a practical vaccine of great preventive value, and more than thirty thousand persons have been vaccinated since 1925. Quite recently (1931) Rumreich, Dyer and Badger have discovered an Eastern and Southeastern states endemic area that is believed to have been infected for the past twenty years. This disease is designated by the authors as the Eastern type of Rocky Mountain spotted fever in contradistinction to the Western type of Rocky Mountain spotted fever. Although immunologically the two types are identical, still they can be differentiated from each other by animal inoculations. The Eastern type produces much milder reactions in guinea pigs than the Western

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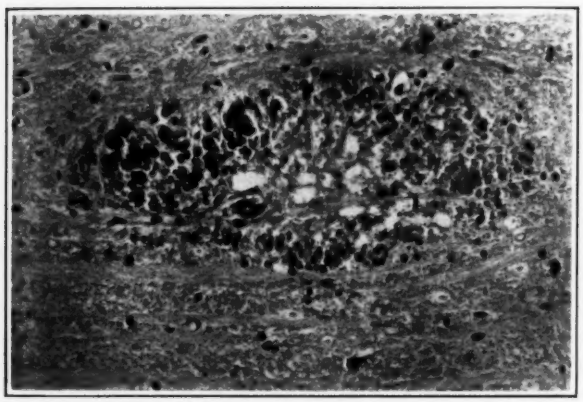

Fig. 1, Case 1
Pons. 325X. A cross section of a thrombosed arteriole. P.T.A.H. stain.

type. Rocky Mountain spotted fever (Western type) is unique in the fact that the virulence varies greatly in different localities, but that the virulence of the infection in any locality is reasonably constant. The areas of greatest known virulence are the west side of the Bitter Root Valley in western Montana, a small section in Kirby Creek in Hot Springs County, Wyoming, and an area in the Wind River Mountains in Fremont County, Wyoming. In these sections the mortality is high, often reaching 90 to 100 per cent. The area of mildest infection is in the Snake River Valley in southern Idaho, where the mortality seldom exceeds 5 per cent. Areas of intermediate severity occur in other sections of the Rocky Mountain region. Ambulatory cases are not uncommon in southern Idaho and eastern Oregon.[1] Spotted fever is a seriously incapacitating disease with an average mortality of 12.5 per cent and a great economic importance. The annual loss of life from spotted fever in the western endemic area now closely approximates 1/8 (12.5 per cent) of 600 cases a year, or between 70 and 80 deaths annually.[2] With the addition of the deaths from spotted fever (Eastern type) in the eastern Southeastern states endemic area, the total for the whole country is about 100 to 110 deaths annually. Within the eastern Southeastern states endemic area, at least 93 cases were known to occur in five states and the District of Columbia in the spring and summer of 1930, with 21 deaths, a case fatality rate of 22.6 per cent.[3] The geographic boundaries of the Eastern type is not definitely known. From the report of cases from various states it is evident that it is widespread east of the Appalachian Mountains. Rumreich, of the U. S. Public Health Service, states that about 150 cases occur annually in this area. The following are the states reporting annually the number of cases of Eastern type of Rocky Mountain spotted fever: Maryland, about 30 to 40 cases; Virginia, about 30 to 40 cases; District of Columbia, about 10 cases; North Carolina, about 10 cases; South Carolina, about 10 cases; Delaware, about 4 or 5 cases; Texas, about 5 cases; Pennsylvania, 3 or 4 cases; New York, 2 cases; New Jersey, 1 case; Long Island, 1 case; Missouri, 1 case; Louisiana, 1 case; Alabama, 1 case; Georgia, quite a number of cases; Tennessee, 6 cases. Although the majority of the cases reported have not been confirmed by immunologic procedures, still the clinical histories and symptoms are so typical that there is little doubt as to the correct diagnosis. Of the extreme Southern states only Texas and Tennessee have confirmed most of their cases by animal tests. The differential diagnosis between endemic typhus (Brill's disease) and the Eastern type of Rocky Mountain spotted fever may at times be quite confusing. Likewise, other diseases simulating

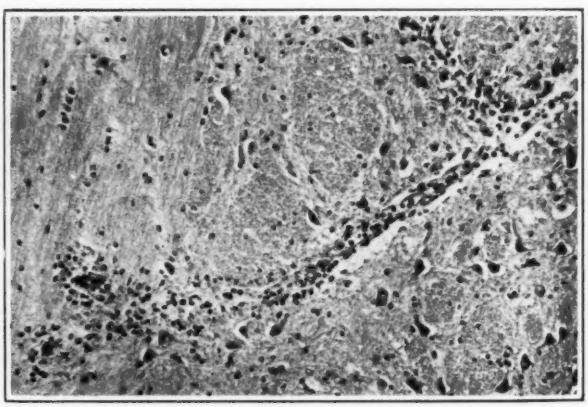

Fig. 2, Case 1
Pons. 200. Note thrombosis of an arteriole at the left, perivascular cellular infiltration and leucocytic infiltration of the pia about the blood vessel. P.T.A.H. stain.

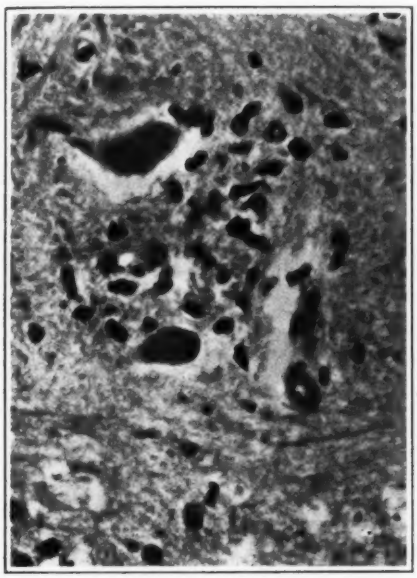

Fig. 3, Case 1
Spinal cord. 550X. Perivascular lesion with glia cell and some large mononuclear phagocytes. H. & E. stain.

these two diseases must be considered. The only certain method of differentiation requires immunologic procedures.

REPORT OF SIX CASES IN TENNESSEE

The first recognized case of the Eastern type of Rocky Mountain spotted fever made its appearance in Tennessee on May 30, 1931, in Dickson, Tennessee, population 3,000, about forty miles from Nashville. On June 4, 1931, the patient, a white girl, age 5, was admitted to the Vanderbilt University Hospital, and she died June 9, 1931. Autopsy presented typical gross and microscopic pathological findings. Symptoms were typical of the Eastern type of Rocky Mountain spotted fever, giving a history of tick bite about one week prior to the onset of symptoms. The second case, a white boy, age 7, occurred in the same family nine days after the onset of symptoms of the first case. The symptoms were typical of Rocky Mountain fever (Eastern type) and a history of recent tick bite was obtained.

Possible Source of Infection.—About six weeks prior to the onset of symptoms of the first case, the next door neighbor received a fox hound from the vicinity (50 miles) of Helena, Montana. Another fox hound was received by the same neighbor from the same source about one week prior to the onset of symptoms of the first case. One year before a fox hound was also received. The fox hounds came from an endemic area of the Western type of Rocky Mountain spotted fever, a few cases having occurred in the vicinity last summer. One case occurred about two miles from whence the hounds came. The fox hounds were allowed to roam at will and it is possible that they carried the infected ticks to Tennessee. Although the *Dermacentor andersoni* (wood tick) does not usually infest dogs, still the *Dermacentor variabilis* (dog tick) does. Since the latter is also found in Montana, it is possible that this tick may become infected and convey the disease as shown by Dyer, Badger and Rumreich.[4] Since the first two cases were not of the Western type of Rocky Mountain spotted fever, it is possible that a modification or attenuation of the virus had taken place within the *D. variabilis* instead of the *D. andersoni* or that certain climatic conditions play some part. Unfortunately the ticks found on the 2 cases were not examined nor were the fox hounds searched for ticks until several months later. At this time only 5 ticks (*D. variabilis*) were found which, when macerated and injected into guinea pigs, failed to infect. The first two cases were in children ages 5 and 7 living in the heart of a residential section of a town with a population of 3,000. The yard and back yard were comparatively small. There

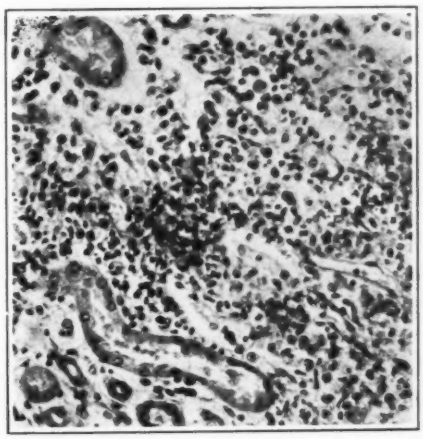

Fig. 4, Case 1
Kidney. 225X. There is extensive leucocytic invasion with necrosis of tubules. Two thrombosed vessels are seen H. & E. stain.

Fig. 5, Case 1

Skin. 2700X. Group of Rickettsiae within muscle cell of media. A definite halo may be seen about most of the organisms. A portion of thrombus is seen at the lower left. Goodpasture's stain.

was no evidence of rodent infestation. House sanitation and surroundings were excellent. These children had not been away from home for six months except occasionally to play with the three fox hounds next door. The dogs had access to a very large back yard which extended several hundred feet. Weeds and bushes were present in the back portion of the yard, giving a favorable location for the moulting of ticks. From the evidence collected, it is at least suggestive that the children received the ticks from the fox hounds that came from the vicinity of Helena, Montana, an endemic area of the Western type of Rocky Mountain spotted fever. It is further suggestive that the virus was attenuated or modified through a different tick passage or climatic conditions or both.

CASE REPORTS

Case 1.—B. D. P., a white girl, age 5 years, was admitted to the Vanderbilt University Hospital on June 4, 1931. On May 29, 1931, the child became sluggish, sleepy and feverish. These symptoms persisted for several days, the temperature rising to 102 or 103°. Two days later a rash appeared over the legs, arms and trunk. For the last three days before admittance to the hospital she cried out when moved, and the last day her neck became stiff. She occasionally complained of stomachache and headache. On admission to the hospital her temperature was 105°. She was drowsy, but rational and quite dehydrated. There was a blotchy, petechial rash over the trunk and extremities. Her neck was stiff.

Laboratory findings were as follows: urinalysis showed specific gravity 1.015; acid; albumin and sugar negative; an occasional white blood cell and no red blood cells or casts. There were 15,000 white blood cells with polymorphonuclears 79 per cent; lymphocytes, 20 per cent; monocytes, 1 per cent. The blood guanidine was 0.36 mg. per 100 c. c.

Two lumbar punctures showed a perfectly normal spinal fluid. The temperature varied from 100 to 105° F. The leucocyte count went up to 40,000. The patient became more restless and handling was quite painful to her. The petechiae became more numerous and spread to the face and neck. Three days after admission the face became edematous, and the edema soon became generalized over the body. There were new petechiae following the application of a tourniquet on the right arm, but the remaining rash was becoming a bluish, blotchy discoloration. The heart, lungs and abdomen remained negative. The urine showed a trace of albumin. The next day, June 8, 1931, the temperature was 103 to 104° F. She seemed more stuporous than before, but was not yet irrational. A moderate

Fig. 6, Case 1

Skin. 2700X. Two groups of Rickettsiae within two different muscle cells. Goodpasture's stain.

generalized edema was present. Her face was so swollen that her eyes were tightly closed. The body was covered with more or less circinate areas of dark red and purplish color which did not fade on pressure. These areas on the hips were thought to have bled on the sheet. The next day her temperature went to 105°; she became comatose and died with a few rales in her lungs, but no increase in respiratory rate. When she was admitted to the hospital the Weil-Felix reaction (Proteus X 19, Type O) was 1 to 10; three days later, 1 to 40. On the day of death the reaction showed an agglutination of 1 to 80 complete and 1 to 160 partial.

Guinea Pig Inoculations.—On the ninth day of the disease two male guinea pigs, each weighing 500 grams, were inoculated intraperitoneally with 4 c. c. each of the whole blood. Four and six days later, respectively, fever developed. The temperature ranged from 39 to 41° C. On the fifteenth day pig No. 1 died. Autopsy showed an enlarged spleen which was smooth and dark red in color. There was no scrotal involvement. Microscopically, the cerebrum, cerebellum, pons and thalamus showed focal gliosis and various vascular lesions, dense lymphocytic and fibroblastic infiltrations in the sheaths of blood vessels. The lesions found were similar to those described by past Assistant Surgeon R. D. Lillie.[5] Pig No. 2 was bled from the heart on the third day of fever. Six c. c. of blood were obtained and 2 c. c. were injected intraperitoneally into each of three male pigs. On the fourth and sixth days fever developed in two while no febrile reaction was noticed in the third pig. This strain has been continued until now it is in the seventy-first generation. Of the pigs that reacted, 35 per cent died.

Rabbit Inoculations.—Four male rabbits were inoculated intraperitoneally with 4 c. c. each of cardiac blood from pigs in the third day of fever. Four of the rabbits developed febrile reactions on the fifth and seventh days, respectively. Both showed scrotal involvement which ulcerated and sloughed and then finally healed. One showed a Weil-Felix reaction of 1 to 20; the other showed a 1 to 40. The other two rabbits showed no clinical manifestations and gave negative Weil-Felix reactions.

Cross Immunity Tests.—The endemic typhus used in this study was isolated from a human case in September, 1931. It is now in its fifty-first generation. The virus of endemic typhus produces a less severe reaction in guinea pigs, and the appearance of the spleen is much less altered than following inoculations with the Eastern type of Rocky Mountain spotted fever virus. In endemic typhus the involvement of the genitalia in male guinea pigs is the rule, while in pigs inoculated with the Eastern type of Rocky Mountain virus testicular involvement was not observed in this series. No evidence of cross immunity between the endemic typhus virus and the strain of virus isolated from *Case 1* has been obtained. Twelve male pigs which recovered from inoculation of the strain of virus from *Case 1* were given intraperitoneal injections of whole blood from pigs with active endemic typhus fever. The majority of the pigs reacted typically to the virus of endemic typhus. Likewise 12 pigs immune to endemic typhus were given intraperitoneal injections of the whole blood from pigs infected with the strain of virus from *Case 1*. The majority of the pigs reacted typically to the Eastern type of Rocky Mountain fever. In each cross immunity test fresh pigs were used as controls.

All guinea pigs used in these experiments were kept in quarantine for at least two weeks prior to inoculation. Temperature and weight charts were recorded twice daily about the same hour in the morning and afternoon. If any untoward variation in temperature was noted they were discarded. Only male pigs weighing between 500 and 600 grams were used. Bloods from virus-infected pigs were cultured at the time of inoculation into fresh pigs.

Autopsy Report from Vanderbilt University Hospital.—Autopsy No. V-31-35 was performed by Dr. Paul N. Harris on June 9, 1931, two hours and twenty-five minutes after death. Only a brief abstract of the pathological findings will be presented, as the complete report is to be published elsewhere.[6]

The anatomical diagnosis showed acute necrosis of the myocardium, liver and pancreas; arteriolar thrombosis in skin, heart, liver, gastro-intestinal tract, kidneys, bladder, pancreas, lymph nodes, spleen, meninges, and brain; acute, bilateral bronchopneumonia; acute splenitis; compensatory anasarca.

Microscopic Notes.—In the heart, many of the capillaries and precapillaries are thrombosed, a few being occluded only by a hyalinized mass of fibrin, but the majority show polymorphonuclear and large mononuclear leucocytes within the thrombi, and in many thrombi there are pyknotic nuclear fragments. Within the surrounding tissue there is an infiltration by polymorphonuclear leucocytes, large mononuclear leucocytes and plasma cells in relatively large numbers, and lymphocytes in lesser numbers. The endothelial cells of the smaller blood vessels are considerably enlarged, and in many vessels there are large numbers of leucocytes. There are many foci in which a few myocardial cells have pyknotic, fragmented nuclei, and intensely eosinophilic, hyaline, curdy cytoplasm, and are invaded by polymorphonuclear leucocytes. There are a great many foci not definitely associated with either acute necrosis of the myocardium or with thrombosis of the blood vessels, in which the interstitial tissue is infiltrated by large numbers of plasma cells and large mononuclear leucocytes and lesser numbers of polymorphonuclear leucocytes and lymphocytes. The endocardium and epicardium are normal. The gastro-intestinal tract, mesenteric lymph nodes, bladder and spleen all show a picture similar to that described for the heart. In the liver some of the branches of the hepatic arteries are partially or completely occluded by hyaline thrombi and are surrounded by leucocytes. Small hyaline thrombi are seen in one portal vein and one hepatic vein. There is a perivascular infiltration of some of the portal triads by lymphocytes, monocytes, and plasma cells even in the absence of arterial thrombosis. There are a number of foci of no particularly definite distribution in which a few liver cells have become necrotic and invaded by polymorphonuclear leucocytes. A few of the liver cells contain fat vacuoles.

In the pancreas, there are many foci in which the stroma is infiltrated by polymorphonuclear leucocytes, monocytes and plasma cells. Some of these are definitely associated with arterial thrombosis, but many are not. In many such areas there is also acute necrosis of the pancreatic acinar cells, the insular tissue being uninvolved. In addition to the numerous thrombosed small arteries, there are several large ones which show partial or complete occlusion by hyalinized fibrin. The kidneys present practically the same picture as described in the other organs. There are a great many foci of greatly varying size within the medullary tissue

in which there is an infiltration by large mononuclear leucocytes, polymorphonuclear leucocytes and plasma cells. Many of these are definitely in association with thrombosed arterioles, although many are not, and some are associated with hemorrhage. There is necrosis of the epithelium of some of the tubules included in these areas.

In the brain and spinal cord a section of cerebral cortex shows a few polymorphonuclear and large mononuclear leucocytes within the pia arachnoid. One blood vessel here and another within the brain tissue are thrombosed and show a large mononuclear and lymphocytic perivascular infiltration. A section of spinal cord shows normal meninges. Sections through the olivary bodies, basal ganglia and spinal cord show some perivascular lesions of a peculiar sort; the adventitia and media of the blood vessels are infiltrated by lymphocytes and large mononuclear leucocytes; in addition to the leucocytes within the nervous tissue there are many small round cells which appear to be glia cells.

The vertebral bone marrow is not remarkable.

Sections of skin from the buttocks and thigh show the thrombosis and perivascular leucocytic infiltration which has been mentioned frequently, an interesting finding being the presence of many thrombosed arteries of rather large size. These thrombosed vessels are seen in the subcutaneous fatty tissue as well as in the true corium. Sections stained by Giemsa's method and by Goodpasture's influenza bacillus stain show Rickettsiae within endothelial cells and muscle cells of the thrombosed arterioles.

Case 2.—D. P., a white boy, age 7, was attended by Dr. Hartwell Weaver, of Dickson, Tennessee. On June 6, 1931, he had a flushed face and headache and felt chilly. His temperature was 101°. The next day he became very restless and irrational with a temperature of 103°. A day later he was comatose, but could be aroused with difficulty. There was a slight opisthotonos with a distinct rigidity of the neck and leg muscles; dilated pupils, nystagmus and twitching of the face muscles; and more or less twitching of the muscles of the entire body. The abdomen was distended and there was tenderness over the whole area with a temperature of 105°. The spleen was palpable. A petechial rash made its appearance over the entire body, which was quite pronounced on the legs, ankles and forearms. Later a purpuric rash was observed in areas. During the course of the disease the temperature was irregular, ranging from 102 to 106° F. The pulse was from 120 to 140. The patient was more or less comatose throughout the course of the disease which lasted about twelve days. Defervescence was by rapid lysis.

The patient was a brother to *Case 1*, living in the residential section of the town. There was no rodent infestation on the premises and the sanitation in general was above reproach. A tick was removed from the back of the neck of the boy three or four days before the onset of symptoms. No blood examination in this case was made.

Case 3.—D. F., a white boy, age 9, was attended by Dr. B. H. Woodard, of Spring Hill, Tennessee. On June 26, 1931, he felt badly with frontal headache. These symptoms persisted for several days, growing severer each day. On July 1 he had a severe frontal headache, general muscular aching, backache and pains in the leg muscles with nausea and vomiting. On July 2, the boy's mother noticed an eruption on his forehead near the hair line and subsequently found this rash more or less generalized over the body. The temperature was 104.5° and the pulse 130. Cervical rigidity was marked. Kernig's sign was positive. A few days later the eruption was petechial in character, 2 to 4 mm. in diameter. On pressure a faint, yellowish brown stain remained with the reddish color returning quickly. This eruption was seen most abundantly on the forearms and wrists and legs and ankles. During the course of the disease the temperature was irregular, ranging from 101 to 105°. The temperature persisted for twenty days. Convalescence was fairly rapid. The patient lived in the country about eight miles from a small town and thirty miles south of Nashville. Home sanitation was excellent and there was no evidence of rodent infestation. The boy on several occasions had removed ticks from his dogs and crushed them with stones. He had removed an engorged tick attached to his abdomen about a week before the onset of his illness. The Weil-Felix reaction was negative on the eighth day of illness. On the twlefth day it was 1 to 320 and one month later, 1 to 640.

Guinea Pig Inoculations.—On the eleventh day of the disease (including 4 or 5 days of malaise), 3 male pigs were inoculated intraperitoneally with 4 c. c. each of the patient's whole blood. Fever developed on the fourth, fifth and seventh days, respectively, in each of the inoculated pigs. One of the pigs showing fever on the fourth day lived six days longer and died. Autopsy revealed an enlarged spleen which was smooth and dark red. No scrotal involvement was noticed. The other two pigs ran a temperature ranging from 39 to 41.5° C. for six to nine days. Six c. c. of blood were obtained from the heart of each of the two pigs and transferred to four pigs, each receiving 3 c. c. of the whole blood intraperitoneally. This strain has been continued until now it is in the sixty-sixth generation. This strain kills about 25 per cent of the pigs that reacted.

No evidence of cross immunity between the endemic typhus virus and the strain of virus isolated from this case known as *Case 3*. In each cross immunity test fresh guinea pigs were used as controls.

Case 4.—M. R. D., a white girl, age 8 years, was attended by Dr. J. W. Sneed of Woodbine, Tennessee. On June 25, 1931, the child became listless, felt badly and had headache. On the morning of the third day a pronounced rash on the wrists and ankles and some on the face was noticed. The rash extended up the forearms and legs and by the fifth day was more or less general over the body. On the fifth day of illness, the rash was a diffuse macular type, practically confluent in the region of the ankles and wrists. Many areas about the ankles resembled a mild subcutaneous hemorrhage. The temperature was 104°. The patient complained of severe headache, pain in all the muscles, especially those of the legs and neck, and severe joint pains. There was cervical rigidity. She was comatose at times. The spleen was palpable. Her temperature ranged from 101 to 105.5° F. with morning remissions. Defervescence was by rapid lysis. Convalescence was rapid. The duration of the illness was 21 days.

The patient lived in the country about five miles from a small town and ten miles from *Case 3*. There was no rodent infestation of the premises and home sanitation was excellent. An engorged tick was pulled off the ear of the child five days before the onset of illness. The Weil-Felix reaction (Proteus X 19, type 0) was negative on the sixth and eighth days of illness. One month later the reaction showed a complete agglu-

tination of 1 to 120. No inoculation tests on guinea pigs were made.

Case 5.—T., a white girl, age 10, was attended by Dr. B. H. Woodard, of Spring Hill, Tennessee. On August 26, the patient felt badly. This state of lassitude and malaise lasted three days. On the fourth day she became very ill; symptoms were ushered in by a chill with a temperature of 104° F., with severe headache and pain in the neck, and general aching of the muscles of the body, especially the calves of the legs and the thighs. Nausea, constipation and anorexia were present. A macular rash was noticed on the forehead near the hair line by the patient's mother. A day later it became more or less generalized, but was most marked on the wrists and ankles. The spleen was palpable. Fever persisted for 21 days, and ranged from 102 to 105° with morning remissions of 1 to 3° F. Her mental condition was one of apathy. There was mild delirium in the second week. Defervescence was by fairly rapid lysis. Weil-Felix (Proetus X 19, type 0) was taken during six days of illness with negative results. On the twelfth day an agglutination of 1 to 80 and partial agglutination of 1 to 160 was observed. One month later an agglutination of 1 to 320, and a partial agglutination of 1 to 640 were noted.

The patient lived in the country about seven miles from a small town and thirty miles south of Nashville, one mile from *Case 3.* There was no evidence of rodent infestation about the premises. The home sanitation was above reproach. During the child's prodromal illness her mother removed an engorged tick from her scalp. The next day the acute symptoms appeared.

Guinea Pig Inoculations.—On the tenth day of the disease 3 male guinea pigs, each weighing about 500 grams, were inoculated intraperitoneally with 3 c.c. each of the patient's whole blood. Fever developed in five, seven and eight days respectively in each of the pigs after inoculation. The average temperature ranged from 39 to 41.5°. The febrile period lasted from four to eight days. One pig was sacrificed on the third day of fever for reinoculation. Eight c.c. of the heart blood were withdrawn and 2 c.c. of the whole blood inoculated intraperitoneally into each of 4 male pigs weighing about 500 grams each. Three of the 4 pigs reacted. This strain was carried in male guinea pigs for twelve generations when it was discontinued. Twenty per cent of the reacting pigs died.

There was no evidence of cross immunity between the endemic typhus virus and the strain of virus isolated from *Case 5.* In each cross immunity test fresh pigs have been used as controls.

Case 6.—P. E., a white man, age 19, was attended by Dr. H. T. McClain and Dr. C. B. Tucker of Knoxville, Tennessee. On August 13, he became suddenly ill with a severe chill; fever 104° F; headache; severe muscular pains over the entire body and especially in the legs, and back of the neck, and he had some abdominal pain. His bones ached. There was delirium at intervals. On the third day a petechial rash appeared over the entire body, except the face, palms of the hands and soles of the feet. The rash was the size of a pin head to ¾ inch in diameter, which did not disappear on pressure. The patient at this time was comatose. His temperature was 104° F. His spleen was palpable. The rash persisted throughout the course of the disease which was about 18 days. Fever ranged from 101 to 104° F. Delirium was noted even with comparatively low temperature, the fever becoming normal by rapid lysis. The rash still persisted about one week after the temperature and pulse became normal. There was a branny desquamation over the body, especially upon the legs during convalescence. Soon after the patient was free from fever a phlebitis of the left femoral vein appeared. This cleared up in about 4 or 5 days. The disease left the patient very emaciated and weak. On the third day the Weil-Felix reaction (Proteus X 19, type 0) was negative. On the ninth day the Weil-Felix test gave a 1 to 20 and on the fourteenth day an agglutination of 1 to 40 complete and 1 to 80 partial. Blood obtained on the third and ninth days of illness was cultured with negative results. The patient lived in the city of Knoxville. He had spent a few days in the country. While there he was bitten by a wood tick. Symptoms developed about seven days after the bite of the tick.

Guinea Pig Inoculations.—On the ninth day of illness 3 male guinea pigs were inoculated intraperitoneally with 3 c.c. each of the patient's whole blood. Fever developed in two pigs on the sixth day after inoculation. The third pig failed to react. The temperature lasted from five to seven days and ranged from 39 to 41.5°C. Cardiac blood was obtained from one pig on the third day of fever and 3 c.c. of the whole blood inoculated intraperitoneally into each of 3 male pigs weighing about 500 grams. All three of the pigs developed fever on the fifth and sixth days after inoculation, which persisted for five or six days. The temperature ranged from 39 to 40°C. This strain is now in its ninth generation. Up to the present time about 20 per cent of the pigs reacting have died. Autopsy on those showed an enlarged spleen which was smooth and dark red in color. Microscopically, in many of the pigs persistent searching showed focal gliosis and various vascular lesions, and dense lymphocytic and fibroblastic infiltrations in the sheaths of blood vessels in the cerebrum, cerebellum, pons and thalamus.

There was no evidence of cross immunity between the endemic typhus virus (Wilmington strain) and the strain of virus isolated from *Case 6.* In each cross immunity test fresh pigs have been used as controls.

EFFECT OF SPOTTED FEVER VACCINE

The vaccine was procured from Dr. R. R. Parker, special expert officer in charge of the Rocky Mountain spotted fever laboratory, Hamilton, Montana. Eighteen guinea pigs were immunized with this vaccine. Six vaccinated guinea pigs were given 4 c. c. each intraperitoneally of the whole blood which was obtained from guinea pigs infected with strain No. 1. Only one pig from this number reacted. The others remained normal. Six vaccinated guinea pigs were given intraperitoneally 4 c. c. each of the whole blood which was obtained from guinea pigs infected with strain No. 3. The result was that none of the pigs became infected. Likewise six vaccinated guinea pigs were given 4 c. c. each of the whole blood intraperitoneally which was infected with strain No. 6. One pig reacted slightly while the others remained normal. Three control pigs were used with each test and all of them reacted.

CHECKING STRAINS AGAINST EACH OTHER

The three strains, from *Cases 1, 3* and *5*, were checked againt each other. Guinea pigs recovering from strain No. 1 failed to react when strain No. 3 or 5 was subsequently inoculated. Also pigs recovering from strain No. 3 are unaffected by subsequent inoculation of strains Nos. 1 and 5. Likewise pigs recovering from strain No. 5 are immune to strains Nos. 1 and 3. No marked difference could be ascertained between any of the three strains except perhaps that strain No. 1 has a higher guinea pig mortality than the two other strains. In conducting the above experiments fresh pigs were employed in each test as controls.

EXPERIMENT WITH TICKS COLLECTED FROM DOGS

In the surrounding community in which *Cases 3* and *5* occurred, 47 ticks were collected from 14 dogs. Eighteen were adults and 29 in the nymphal stage. All of the ticks proved to be the American dog tick (*Dermacentor variabilis*). Twenty nymphs and 14 adult ticks were inoculated into guinea pigs by the following procedure. Each tick was emulsified in 4 c. c. of normal saline and 2 c. c. of the emulsion injected into each of 2 fresh pigs. Thirty-four ticks (20 nymphs and 14 adults) required 68 pigs. A temperature chart and weight record were kept for each pig. Eleven pigs died within two weeks of the inoculation. Autopsy showed in most instances intercurrent infection. No enlarged spleen was noticed in any of them. From the pigs which developed fever, 6 to 8 c. c. of cardiac blood were obtained on the second or third day of fever and 3 c. c. of the heart blood were injected intraperitoneally into each of 2 or 3 pigs. All of the pigs thus injected survived and no fever was recorded in any of them. The remaining 23 pigs showing no untoward symptoms as a result of the tick inoculation were inoculated two months later with 3 c. c. of the whole blood obtained from the heart of pigs infected with the strain of *Case 3*. All of the pigs developed fevers from three to seven days after inoculation. This extra testing was for the purpose of eliminating the possibility of checking up on occasional afebrile cases. The result of the above experiments proved that none of the 34 ticks collected from dogs contained the Eastern type of Rocky Mountain virus.

ACKNOWLEDGMENT

Grateful acknowledgment is hereby made to Dr. Paul N. Harris of the Vanderbilt School of Medicine for the autopsy report and the photomicrographs of *Case 1;* also to many of the medical profession who have aided in this investigation.

CONCLUSIONS

(1) Two years ago Rocky Mountain spotted fever (Eastern type) was unrecognized in the Eastern and Southeastern states. For the past year more than 150 cases have been reported east of the Appalachian Mountains.

(2) Six cases are reported in Tennessee with one death, all giving typical symptoms of the disease and history of recent tick bite.

(3) The patient who died came to autopsy and presented typical pathological findings, both gross and microscopic.

(4) It is possible that the disease was introduced into the State by three fox hounds which were shipped from the vicinity of Helena, Montana, an endemic area of the Western type of Rocky Mountain spotted fever.

(5) The virus from 4 of the 6 cases was recovered by guinea pig inoculation. Strain No. 1 has been maintained for seventy-one generations, strain No. 3 for sixty-six generations, strain No. 5 for twelve generations, and strain No. 6 for nine generations to date.

(6) No evidence has been obtained of cross immunity between the endemic typhus virus and the strains of virus isolated from the four cases.

(7) Ticks (*Dermacentor variabilis*) collected from dogs within the neighborhood of 2 of the cases were macerated and inoculated into guinea pigs in the attempt to isolate the virus. Negative findings resulted. No ticks of the *Dermacentor andersoni* variety were found.

(8) Guinea pigs immunized with the spotted fever vaccine failed to become infected with the viruses of *Cases 1, 3* and *6*.

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DISCUSSION (*Abstract*)

Dr. Henry E. Meleney, Nashville, Tenn.—With the discovery of the occurrence of Rocky Mountain spotted fever in the Southern states I believe that the most important thing is for the public health officials to have this disease in mind so that it can be recognized and differentiated from other eruptive fevers when it

occurs. The fact that it is usually a rural rather than an urban disease and that it can usually be associated with contact with ticks ought to bring it to the mind of the health officer and give him the first means of differentiating it from typhus fever. Of the clinical manifestations, the distribution of the eruption with emphasis on its intensity on the extremities, head and back, and its presence on the palms and soles, seems to be the most important point in its clinical differentiation from typhus.

Dr. L. F. Badger, Washington, D. C.—Dr. Litterer is to be congratulated on his work in isolating strains of Rocky Mountain fever from human cases occurring in Tennessee. With a virus which produces fever as the only clinical manifestation in the guinea pig, the isolation of the virus is not simple. Secondary infections are common in the guinea pig and such infections are easily confused with Rocky Mountain spotted fever of the eastern part of the country. Dr. Litterer kindly sent his strains to the National Institute of Health for comparison with the strains studied at that institution for the past three years. His strains and those isolated from human cases in Virginia were found to be identical.

Dr. Litterer discusses the probability of his cases having had as their origin the virus in ticks on dogs brought into Tennessee from Helena, Montana. Since there have occurred other cases in Tennessee and the surrounding states, I am inclined to believe that his cases originated from infected ticks originating in the state. The peculiar life cycle of the tick, and the fact that it is in the nymphal and adult stages that the tick feeds as a rule on man, lends further strength to the probability that the cases were not infected by ticks imported from Montana.

Dr. John S. Crutcher, Jr., Nashville, Tenn.—I had the opportunity of seeing the first patient discussed by Dr. Litterer. Until that time Rocky Mountain spotted fever was a disease of which I had heard, but one which I had expected never to see. Consequently, when the child was admitted there was some uncertainty as to the correct diagnosis, measles, meningococcus meningitis with septicemia, and typhus fever being uppermost in our minds. I mention this because of the ease with which the correct diagnosis may be missed unless we realize that Rocky Mountain spotted fever is no longer an extremely rare disease in this part of the country.

Dr. Litterer (closing).—The first recognized case of the eastern type of Rocky Mountain spotted fever made its appearance in Tennessee in a small town, with a population of about 3000. The second case appeared nine days later in the same family. These two patients, ages 5 and 7, brother and sister, lived in the heart of the residential section of the city and had not been out of the city for more than six months. Strong evidence suggests that at least these 2 cases of the disease were introduced from Helena, Montana, by means of fox hounds. Investigation showed that the fox hounds came from an endemic area of Rocky Mountain spotted fever, several human cases having been reported in the immediate vicinity whence the fox hounds came. The hounds were allowed to roam at will in the surrounding country. One hound was shipped from this neighborhood one year prior to the onset of symptoms of the first case. The second hound arrived six weeks before the onset of symptoms, while the third hound came one week before the onset of illness. These fox hounds were kept next door to the cases and the children (cases) often played with them. The hounds had access to a very deep lot or back yard heavily grown up with underbrush, making an ideal place for the propagation of ticks. According to authorities, ticks may stay on dogs as long as ten days before dropping off. Since only two or three days are required in transportation from Helena, it is easily possible that the hounds introduced infected ticks into Tennessee.

ROCKY MOUNTAIN SPOTTED FEVER*

By JOHN S. CRUTCHER, JR., M.D.,
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For a number of years Rocky Mountain spotted fever has been known to be endemic in the Northwestern states, but it is only recently that it has been recognized east of the Mississippi River. Rumreich, Dyer and Badger,[1 4] in the course of their epidemiological study of endemic typhus fever in the Eastern and Southeastern states, collected 93 cases of Rocky Mountain spotted fever. These cases were found in rural communities in Delaware, Maryland, Pennsylvania, Virginia, North Carolina, and the District of Columbia.

It is because this patient represents the first proven case of Rocky Mountain spotted fever reported in Tennessee, and because several cases have been recognized subsequently in the State that this case is presented.

This disease, as described by Spencer,[2]

"is an acute, non-contagious tick-borne disease, endemic in the Northwestern states. Clinically it closely resembles typhus fever and is characterized by an onset with chill, continued fever, severe headache, pains in the bones and muscles, and a macular and sometimes papular eruption which appears about the third day of fever, first on the wrists, ankles, and back, and then over the whole surface of the body."

The disease in Montana is transmitted to man by means of the bite of the wood tick, the *Dermacentor andersoni,* which has been infected in the latent stage from wild rodents, as, for instance, the ground squirrel, the pine squirrel, the chipmunk, and many others. The *Dermacentroxenus rickettsii,* described by Wolbach[3] in 1916, is considered the causative agent. Dyer[4] found that the dog tick, the *Dermacentor variabilis,* which he found in districts in which his cases were found, could transmit the virus to experimental animals. The disease occurs dur-

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*From the Department of Pediatrics, Vanderbilt University Medical School.

ing the spring and early summer months, the time in which the adult ticks are active, and all ages may be attacked, depending only on the opportunity accorded the infected ticks. The fever begins rather abruptly four to seven days after the tick bite, remains high for seven to ten days with daily morning remissions, and then declines by rapid lysis, normal being reached two or three weeks after the onset. Characteristic features include pronounced headache, muscular pains, especially of the back, a marked tendency toward restlessness and insomnia and in severe cases stupor, and, of course, the rash which at first is macular, fading on pressure, then petechial, and finally ecchymotic or purpuric.

Pathologically, little is to be seen on gross examination except subcutaneous hemorrhage and enlargement of the spleen. Microscopically there is a perivascular infiltration in the subcutaneous tissue. The small vessels may be occluded by phagocytic mononuclear cells and degenerating endothelial cells with resulting necrosis and infarction. Similar vascular lesions may be found in various organs, including the gastro-intestinal tract, and, in cases of the Eastern type, in the brain.

The mortality varies tremendously, depending on the locality. Thus in the Bitter Root Valley, Montana, the mortality is given as 76.81 per cent for the twelve-year period from 1917 to 1928. A mortality rate of 3.5 per cent is quoted from Idaho during seven years from 1910 to 1916. Of the 93 patients collected by Dyer, 21 died, giving a mortality of 22.16 per cent.

The differential diagnosis includes typhus fever, meningococcus meningitis with septicemia, confluent measles, and smallpox. Measles is particularly confusing early in the disease because, in addition to the rash, most patients with Rocky Mountain spotted fever show slight catarrhal respiratory signs, such as a mild cold and slight redness of the conjunctivae. However, the seasonal incidence of the disease, the absence of Koplik's spots, and finally the different distribution of the rash should prohibit the diagnosis of measles. Typhus fever may be almost identical and is to be differentiated conclusively only by cross immunity tests in laboratory animals. However, there are several distinguishing features between the two diseases. Typhus occurs during the summer months, rather, during the spring months. It occurs in those people employed in food handling establishments, while Rocky Mountain spotted fever occurs in people having rural contacts. The rash has a different distribution in the two diseases, that of typhus appearing first on the chest and abdomen instead of the extremities, as is the case with Rocky Mountain spotted fever.

This patient, B. D. P., a white girl of five years, living in Dickson, Tennessee, was sent by Dr. H. Weaver, of that city, to Dr. Howard Robertson. She was admitted as his patient on the pediatric service of Vanderbilt University Hospital on June 4, 1931.

The past and family histories were irrelevant with the exception that two weeks before the illness began she had been exposed to measles. Early in the disease measles was considered as a possible diagnosis.

One morning, a week before admission, she failed to get out of bed and seemed sluggish and sleepy. She was found to have slight fever. The drowsiness continued until the time of admission, being more marked during the day. At night she became somewhat restless, sometimes crying out, and at times complaining of abdominal pain. On only one occasion did she complain of headache. Two days after the onset of symptoms a rash developed over the legs, arms and trunk, which resembled but was not typical of measles. She had no coryza. Four days after the onset she began crying whenever she was moved and her mother thought that her neck was sore. It had been stiff twenty-four hours before admission. She had had only two stools during the week prior to admission, but she had taken very little food and fluids. There had been no nausea and vomiting. The fever had continued from the time of onset to the time of admission, ranging between 102 and 103°.

On admission the temperature was 105°, the pulse rate 152 per minute, and the respiratory rate 35 per minute. She looked quite sick. She was drowsy but rational. The skin was dry and there was evidence of recent slight loss of weight. The breathing was at times periodic, especially when she was disturbed. There was an occasional sigh. The head appeared normal and was not retracted. External and ophthalmoscopic examination of the eyes revealed nothing abnormal. The mouth was extremely dry and the tongue was fissured. There were no Koplik's spots seen. The ears, nose, throat, heart, and lungs were considered normal. There was no general or local glandular enlargement. The abdomen was not abnormal. The spleen was not felt. The superficial and deep reflexes were present. The Kernig and Brudzinski signs were positive. Over the arms and lower extremities there was a macular rash, fading on pressure. In some places the rash was petechial.

The blood examined was found to contain 15,600 leucocytes per cu. mm., 79 per cent being polymorphonuclears, 20 per cent being lymphocytes, and 1 per cent mononuclears. No eosinophils were seen and no abnormal cells were noted in the smear. There were 12.6 grams of hemoglobin per 100 c. c. of blood. Subsequent blood counts on the second and fourth day in the hospital were 40,160 and 38,400, respectively. The urine on admission was found to have a specific gravity of 1.015 and no albumin, sugar, or abnormal cells were

found. The blood Wassermann was later reported negative and 0.1 mg. of old tuberculin was negative.

A tentative diagnosis of meningococcus meningitis with septicemia was made and lumbar puncture done. The fluid was obtained under what seemed to be slightly increased pressure. It was clear, containing only three cells. The Pandy test for globulin was negative. She seemed somewhat brighter following the puncture. A blood culture was made which, along with a subsequent culture, was negative.

The following day she appeared more restless and stuporous, crying at times. Handling seemed to cause pain. The petechial rash had become more widespread, the chest, neck, face, and arms being covered with bright petechiae. The face and hands were thought to be slightly swollen. Another lumbar puncture was done and the spinal fluid was again found to be normal. Gastric lavage returned dark brownish black material with some bright blood.

On the tenth day of illness, or the third day of hospitalization, she continued to be stuporous with periods of restlessness, and was given small doses of phenobarbital. During the day a stool contained dark blood.

On the eleventh day the edema had increased so that the face was markedly swollen. The eyes were almost closed. Urinalysis was again negative except for a trace of albumin. Following the application of a tourniquet there appeared many bright petechiae on the right arm. Elsewhere there were no new petechiae; instead the body exhibited a bluish blotchy discoloration. The respiration had gradually climbed up to 40 per minute, but no abnormal sounds were found in the lungs.

On the twelfth day she appeared much worse, being more restless. The face had become so swollen that the eyes were tightly closed and there was slight generalized edema. She had become more and more stuporous and appeared to be in coma, although at times she could be aroused. The temperature, which had fluctuated between 100 and 104°, remained fairly steady at 102 to 103°. Over the body there were many irregular, more or less circinate, areas of dark red and purplish color which would not fade with pressure and which gave the skin a mottled appearance. On the hips a few of these areas were slowly oozing blood.

The patient became gradually but steadily worse, developed signs of bronchopneumonia, and died the next, or thirteenth, day of the illness.

Throughout her stay in the hospital an adequate amount of fluids was administered by means of proctyclysis of 5 per cent glucose and hypodermoclysis of saline or Hartmann's solution. She was transfused on the ninth and twelfth days of the illness.

Necropsy was done in the Department of Pathology by Dr. Paul N. Harris[5] two and one-half hours after death. In addition to terminal bronchopneumonia, arteriolar thrombosis typical of Rocky Mountain spotted fever was found in the skin, heart, liver, gastrointestinal tract, kidneys, bladder, pancreas, lymph nodes, spleen, meninges, and brain. Rickettsiae were demonstrated within endothelial cells and muscle cells of the media of thrombosed arteries of the skin.

Bacteriological and immunological studies done by Dr. William Litterer,[6] Director of the Division of Laboratories of the Tennessee State Health Department, have proven conclusively the identity of this disease. Using *B. proteus* X 19 type O in the Weil-Felix test, agglutination was obtained with dilution of 1 to 10 shortly after the patient's admission to the hospital, with dilution of 1 to 40 three days later, and with a dilution of 1 to 80 on the day before death. Blood taken on the ninth day of illness and inoculated in guinea pigs produced lesions similar to those described by R. D. Lilie[6] in his study of the Eastern type of Rocky Mountain spotted fever. Cross immunity tests were done and no evidence of cross immunity between Rocky Mountain spotted fever and endemic typhus was found.

Epidemiologically, this case was extremely interesting. Six weeks prior to the patient's illness a neighbor received a fox hound from Helena, Montana, an area in which the disease is endemic. Five weeks later a second hound was received. These dogs were allowed to roam around and frequently played with the children. Nine days after this the patient became sick. Her brother had an illness clinically typical of Rocky Mountain spotted fever, from which he recovered. The mother remembered removing ticks from both children a few days prior to their illnesses.

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DISCUSSION (*Abstract*)

Dr. William Litterer, Nashville, Tenn.—Dr. Crutcher is to be congratulated in presenting the first case of the Eastern type of Rocky Mountain spotted fever that was recognized in the State of Tennessee. I had the good fortune to do animal inoculations and immunological studies of this case. I have carried the virus of this case through 76 generations of animal inoculations and intend to carry it indefinitely. Cross immunity tests with the endemic typhus fever virus (Brill's disease) show a separate and distinct disease from Rocky Mountain spotted fever. These two diseases are at times difficult to diagnose clinically and the only sure way to make a differential diagnosis is by animal inoculations and cross immunity tests. I am reporting before the Association five additional cases of Rocky Mountain fever that have since occurred in the State. Three of these cases have been confirmed by animal inoculations and cross immunity tests. It is possible that this disease has existed for a long time in the State unrecognized, but I believe we have very good evidence in Dr. Crutcher's case that the disease was introduced by importation of two fox hounds from Helena, Montana, which is an endemic area of Rocky Mountain spotted fever. Two children, a brother and sister, contracted the disease in about ten days to two weeks after playing with the fox hounds that had been recently sent from Helena, Montana. The American dog tick (*Dermacentor variabilis*) has been shown by Dyer, Badger and Rumreich, of the U. S. Public Health Service, to be capable of transmitting the disease. So it is quite suggestive that the disease was introduced into the State in this way.

USE OF EMBRYO CHICK IN INVESTIGATION OF CERTAIN PATHOLOGICAL PROBLEMS*

By ERNEST W. GOODPASTURE, M.D.,
Nashville, Tenn.

The experimental use of the embryo chick was apparently initiated by students of embryology toward the end of the last century.[1 2] Operative procedures were employed to study the development of various parts of the earliest embryonic structures and to modify them in order to observe the results of the interference.

Following these earlier studies the chick embryo has been used extensively not only for the solution of problems of experimental embryology, but for the purpose of observing the behavior of transplanted tissues from the same and even from alien species.[3 4] These studies have included the implantation of various tumors upon the embryonic membranes.

The possibilities offered by this living tissue for the study of infections has not yet been thoroughly explored, although there are indications which suggest that much of interest and importance may be revealed by an appropriate method of procedure.

Our interest in this technic was aroused as a result of a study of one of the virus diseases, namely, fowl-pox. We were trying to obtain the virus in quantity uncontaminated by ordinary bacteria. By using minute amounts of uncontaminated virus Dr. Woodruff succeeded regularly in infecting the chorio-allantoic membrane. The lesion was extensive and typical of the disease and usually uncontaminated by bacteria.[5]

The technic which we employed represents a modification of those previously described. It is relatively simple. Fertile hen's eggs are incubated in an ordinary bacteriological incubator which is kept moist by the presence of water in shallow pans. After incubating six to twelve days the eggs are candled and the air sac and the shadow of the membranes are outlined with a wax pencil. We have been using a fairly large number of eggs for this and other experiments, and in order to facilitate cutting a window in the shell for the purpose of inoculation we use a small, thin emory wheel, such as mechanics employ for a variety of purposes, mounted on a steel handle which may be inserted into the chuck of a covered flexible shaft operated by a small motor designed for speed control. These motors and shafts are standard dental equipment.

By means of this apparatus, windows of any convenient size may be cut through the shell overlying the membrane shadow in a number of eggs in a short time. At the first operation the shell wall is penetrated, but the underlying tough shell membrane is left intact. Several eggs may thus be prepared in succession. The window and a margin of surrounding shell are then covered with a thin coat of melted paraffin (about 45° C.) and the egg is replaced in the incubator until it is to be inoculated.

The next step consists in exposing the shell membrane by lifting off the piece of shell at the site of the window. A thin coating of melted paraffin is then laid over the opening. This serves to fix any loose particles and bacteria; and it leaves a sterile field in which to work. The shell membrane is removed by tearing it along the edges of the window with the point of a pair of fine curved forceps, tearing outwardly in order to avoid injuring the embryonic membrane beneath. It is then folded back and torn off or cut with fine scissors. The vascular chorio-allantoic membrane is thus exposed and is inoculated either with a drop of virus suspension or by applying to it a small fragment of infected tissue. These operations should be done rapidly and in a warm place. From a syringe containing a mixture of vaseline and paraffin of proper consistency a ring is laid about the window and a sterile coverglass is placed upon it and sealed. The egg is then replaced into the incubator with the window up. Through this window the progress of the lesion may be observed at will.

It is necessary of course to observe a rigid aseptic technic to prevent bacterial contamination, but with a little experience accidental infections may be reduced to a minimum.

Following our experience with fowl-pox we were enabled to infect the chick membranes with other viruses, namely, those of herpes simplex and vaccinia.[6] Successful infection of the membranes with herpetic virus was of especial interest, because baby chicks and adult fowls seem to be completely insusceptible to infection with this virus. Nevertheless, the herpetic lesions of the chorio-allantoic membrane develop rapidly; they are quite typical of the disease and are rich in virus. A similar experiment em-

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*From the Department of Pathology, Vanderbilt University Medical School.

ploying this technic has recently been reported by Rivers and Schwentker, who were able to infect the chick membrane with the virus of a disease of parrakeets differing from psittacosis, to which newly hatched chicks are naturally immune.[7]

It is evident from these experiments that the embryonic cells of the chick are more susceptible to certain viruses than are those of adult chickens, and they may prove to be an acceptable culture medium for some of the viruses with which it has been found to be difficult or impossible to infect a foreign host. We have attempted, thus far without success, to infect the embryonic membranes with the viruses of varicella, zoster and molluscum contagiosum. Such attempts employing other viruses will be continued.

The virus of vaccinia finds an exceptionally favorable medium for reproduction in the membranes of the chick embryo. For the past year and a half we have been cultivating vaccine virus in this way. One strain has been maintained without any demonstrable bacterial contamination, as indicated by ordinary methods, through 56 successive generations. The lesion is extensive and is rich in virus. Guarnieri bodies, the cytological characteristic of vaccinal infection, are numerous and large.[8] At the present time we are investigating the possibility of employing this tissue for the production of a vaccine which may be used in anti-smallpox prophylaxis.

In the course of these investigations we have had opportunity to observe a variety of lesions in the embryonic membranes resulting from trauma and from bacterial infections.

After a window has been cut and the shell membrane is removed, the embryonic membrane tends to fall away from the periphery about the window, and after further incubation of several days the detached area seems to increase. In sections of such membranes the process of keratinization may be followed, and in many cases the presence of epithelial pearls become conspicuous, especially if there has been manipulation and trauma such as might dislocate a few epithelial cells from the ectodermal layer. This phenomenon has been previously noted, particularly by Huxley and Murray in their study of tissue grafting.[9]

As a result of chance contaminations or following the direct introduction of infected material upon the membranes an inflammatory response which, we judge from limited observations, is characteristic for the type of infecting micro-organisms, can be readily followed through various stages in its progress. *Staphylococcus aureus*, for example, will cause a local reaction, definitely circumscribed; a mold with which the membrane becomes occasionally infected elicits a characteristic though mild inflammatory response. In a single instance material from a bronchus from a child dead of whooping cough, inoculated upon the chick membrane, resulted in a marked inflammatory reaction, and smears made after an incubation period of 24 hours showed vast numbers of minute gram-negative bacteria morphologically resembling *B. pertussis*, most of which seemed to be growing within the inflammatory cells.

A systematic investigation of the effect of a variety of known pathogenic microorganisms, such as, for example, *B. diphtheriae*, streptococci and yeasts, would undoubtedly prove of interest, and should local lesions result, their pathogenesis could be studied with great ease and accuracy. The lining membranes, easily observed through an artificial window, offer the exceptional advantage over artificial culture media in that not only can pure cultures be propagated on them, but virulence may be sustained or possibly increased, and the reactions of a living host are brought to view.

There is offered here also an excellent opportunity for the study of non-infectious injuries of various sorts, such as the vascular and cellular response, and the foreign-body reaction. We have been interested to examine the normal and inflamed membrane under very high magnifications. When the membrane is exposed it tends to fall away from the window, but it is a simple matter to inject some sterile air under the membrane and thus cause it to bulge into the aperture and remain in that position until a coverslip ringed with a mixture of vaseline and paraffin has been placed over the opening to seal it. Under these conditions the surface of the exposed membrane touches and adheres to the under-surface of the coverslip, and will remain in contact with it indefinitely. By means of the Leitz ultropaque equipment the membrane may be illuminated from above and even oil immersion lenses may be employed to study the living tissue. The capillary circulation and the ameboid wandering of leucocytes are clearly and impressively brought into view.

Another field which so far as I am aware has received little investigation directly by experimental procedures, is that of immunity responses in the developing embryo. In our stud-

ies of vaccine infection of the chick membranes, two or three chicks whose membranes were successfully infected have hatched, although the great majority die on the fourth or fifth day. These chicks have been immediately revaccinated and have proven to be immune to vaccinia, while normal controls inoculated at the same time developed typical vaccinia. These experiments are being continued in the hope of gaining some information about this interesting subject. An investigation of the possibility of eliciting antibody responses, such as those of agglutination and precipitation, in the embryo, would be of great interest.

SUMMARY

It has been my object to point out to you some of the possibilities which the embryo chick technic offers for the investigation of problems of disease rather than to present any complete results which we have obtained by means of it. In our own experience, however, the method has been of great value in the study of some of the virus diseases, and we hope to be able to utilize it further with profit in this field of investigation. The possible value of this method in the study of bacterial infections and certain immunity responses has also been indicated.

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DISCUSSION (*Abstract*)

Dr. Earl B. McKinley, Washington, D. C.—The method of cultivating filterable viruses described by Dr. Goodpasture will serve to stimulate others to attempt such work with other viruses. Many of us feel that the cultivation of the ultramicroscopic viruses is the most fundamental problem facing us in this field of work and that when cultivation is accomplished, particularly on artificial mediums if possible, progress in the study of these agents will be more rapid. Certainly Dr. Goodpasture and his co-workers are to be congratulated upon this advance in technic and I feel sure it will prove a real stimulus to those interested in viruses.

A STUDY OF THE SINUSES IN A GROUP OF PATIENTS COMPLAINING OF VAGUE CHEST SYMPTOMS*

By SAM H. SANDERS, M.D.,
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The sinuses of a large number of patients complaining of vague chest symptoms in whom a diagnosis of chronic bronchitis was made by one or more physicians have been examined to determine the existence of clinical and x-ray signs of sinusitis. It was hoped to obtain some idea of the relationship of these two conditions when the latter has been ignored by the patient and physician. Therefore, this group does not include the patients who attach their primary symptoms to the sinuses or have had a diagnosis of sinusitis before they were referred to the specialist. Many of the patients gave no symptoms of sinusitis in their histories. Some denied that there was anything wrong with their heads. Others admitted having frequent colds and nasal discharge, but could not realize that this had any bearing on their chest condition, as they had had catarrh all their lives. It was necessary to ask leading questions to obtain the history that would be expected in these cases. On the other hand, some patients could recall the onset and dated their symptoms from an attack of influenza or a bad cold that lasted weeks.

Cases with definite tuberculosis or asthma have not been included in this study. However, many have had a diagnosis and some have been treated for tuberculosis, although the tubercle bacillus was not demonstrated at any time. Practically every patient in this series has had a sputum examination daily for ten consecutive days. All were negative for tuberculosis. Definitely allergic cases have been excluded, but only a few of the cases have received a thorough allergic study.

Everyone is aware of the frequency of upper respiratory infections in individuals with chronic pulmonary disorders. The otolaryngologist has often presented the subject to us under various titles. The internist usually writes about non-

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tuberculous broncho-pulmonary infections or acute and chronic infections commonly mistaken for tuberculosis, bronchitis and bronchiectasis or chronic basal non-tuberculous pulmonary inflammation. Under the last big name we missed much of the early literature on bronchiectasis. It may not be a credit to us for the internist to find a bronchiectasis in many of our old patients. We hope to see the time when the family physician will apologize to us if he lets his patients reach the stage of bronchiectasis without a search for a definite upper respiratory infection, unless the evidence of the cause is elsewhere.

No attempt is being made to prove that there is a definite pathological condition in the sinuses that causes a certain type of chronic change in the lungs. However, for practical purposes it is possible to classify these cases in broad groups, according to the severity of the disease, disregarding the duration of the infection. Sometimes the changes are slow in taking place, which may be due to low grade infection, greater resistance of the individual or proper attention to the cause. On the other hand, the same changes may take place in a much shorter period of time due to virulence of the organism and lowered resistance of the patient.

It is my impression that internists have satisfied themselves that practically all these types of chronic chest conditions progress in rather a uniform manner. We have a tracheitis, a bronchitis with its various stages, a peri-bronchitis, and finally a bronchiectasis. These conditions develop from chronic irritation or recurring infection and the upper respiratory tract is the usual source of the foreign agent.

The deeper portion of the air passages are protected by ciliary movements in the tracheal and bronchial mucosa, tortuous passages and the active phagocytic function of the macrophage in the ultimate air passages. One need only examine the lungs and associated lymph nodes at any postmortem of man to obtain an idea of the large amount of organic and inorganic matter which has escaped all these protective mechanisms. It follows that the etiology of respiratory disease will be complex and that a variety of micro-organisms and parasites may gain lodging and the opportunity to multiply in the many recesses of the respiratory mucous membrane, and each may establish its own type of disease. These invaders may enter cooperatively or follow one another, this adding to the difficulty of analyzing accurately the relation of the micro-organism to the lesion produced.

In the study of the upper respiratory flora of infants, Yale and Kneeland[10] found that the upper respiratory tract was sterile at birth. The basal flora in the first two weeks of life became comparable to that of adults except that the potential pathogens were absent. During the ensuing months the potential pathogens might appear without any symptoms, and by the eighth month the infant's flora was entirely comparable to the adult's. There was no evidence of a specific bacterial incitant for the first cold of infancy. In infants with recurrent colds, secondary infection of the nose with pneumococci or Pfeiffer's bacillus probably played a part. A striking change was noted in the noses of these infants, the picture presented being similar to that of chronic winter colds in adults, purulent nasal discharge, and so forth.

If these potential pathogens are in the nose, they may reach the chest by aspiration, inhalation, direct extension by the lymphatics and probably the blood stream. It is possible for the foreign material to be aspirated into the bronchial tree during anesthesia, during sleep and even accidentally during consciousness. We might add that since iodized oil was introduced by Sicard and Forrester in 1922 for the purpose of visualization of the bronchial tree, aspiration of foreign material has been utilized for diagnostic purposes. Myerson bronchoscoped 200 children immediately after tonsillectomy and found blood in the larynx and tracheobronchial tree in 75.5 per cent. Thirty-four years ago Hoescher determined that in the lungs of etherized animals the buccal secretions that he had previously stained were found constantly in the tracheobronchial tree and even occasionally in the alveoli. Radiopaque substances have been placed in the sinuses and nose and later found in the tracheobronchial tree. The fact that lipiodol can be dripped over the base of the tongue through the larynx without cocainization demonstrates beyond a doubt that any secretions on the posterior pharynx may enter the chest at almost any time. In 1920, Mullens and Ryder found that light fluids were readily inhaled from the nose, producing massive changes in the lungs. Because of the rapidity of the change and absence of any signs of absorption along the lymphatics they concluded that the substance had been inhaled. The year before, Mullens reported his classical lymph drainage experiment that you are all familiar with, which proved that it is possible for carbon particles injected in the maxillary sinuses finally to enter the lungs through the deep lymphatics. He found that the

bronchial nodes were involved in every instance of lymphatic absorption from the sinuses.

That infection sometimes progresses by direct extension is more than likely, but it would be impossible to separate these cases from those in which the infection has reached the lung by inhalation. The extension may take place by the hematogenous route, but this would also be difficult to prove experimentally. In 1920, when Olitsky and Gates were experimenting on the causative agent of influenza, they took the saline washings from the nose and posterior pharynx of patients who had had influenza for 36 hours and injected them into the trachea of rabbits, producing a clinical pathological condition. The organisms were found to pass through Berkfield V and N candles. In the course of their experiments they found that in the absence of ordinary bacteria the lungs showed hemorrhagic edema and emphysema, but when the contaminating organisms were present in the lungs consolidation or even abscess formation occurred from which the ordinary bacteria could be recovered in predominating numbers. It has been noted that cases of influenza in men uncomplicated by these concurrent infections tend quickly to recover, but in the event of these infections the diseased processes are rendered more intense. The impression is widespread that the inciting agent of influenza renders the lung structures more vulnerable to bacteria, many of which are ordinarily present in the healthy nasopharynx. Thousands of cases of non-tuberculous pulmonary disease have been reported in the literature in all stages of development. In most of these some upper respiratory infection was present.

We are all familiar with the acute infection of the nose followed by a suppurative sinus condition. On the third or fourth day the patient develops a cough that is worse when reclining. We find an antrum involved, irrigate it and the patient reports the next day that he had a good night and hardly coughed at all and felt much better. By the next day the cough may return. It is remarkable how a cough will clear up for 24 hours after irrigating the antrum. Oftentimes there is no permanent damage resulting, but frequent infections of this character may sooner or later produce some secondary changes in the chest. Of course, it is true that all acute suppurative sinus conditions do not respond so nicely to drainage.

Occasionally a patient presents himself with a history of afternoon elevation of temperature, cough, general malaise, a very slight loss of weight, susceptibility to colds, tickling in the throat, post nasal discharge worse in the mornings, and probably headache. Examination of the nose does not reveal any noticeable variation from the normal. Transillumination of the sinuses is negative. An x-ray might show a uniform thickening of the mucous membrane lining one or more sinuses, so slight that it might be overlooked on casual observation. The case is referred to the internist and he reports there is no evidence of tuberculosis, but from the findings there must be some upper respiratory infection. The teeth are good, the tonsils have usually been removed and the sinuses do not appear to be diseased enough to produce so much trouble.

It has been my privilege to have observed a number of these cases.

A woman, age 27, the wife of a dentist, had been confined to a sanatorium for treatment of tuberculosis for six months with only temporary improvement. The afternoon elevation of temperature persisted. She was incapacitated and almost desperate. The true condition as we saw it was explained to the patient. Although no promise as to the results of operation could be made, the patient was willing to submit to any procedure that offered a possibility of relief. A bilateral Luc-Caldwell antrum operation with exenteration of the ethmoids by the trans-antral approach was performed. The lining membrane appeared almost normal on inspection. There was a yellowish shining appearance of the surface and an encapsulated droplet of pus and small polypus on the floor of the antrum. The mucous membrane elevated easily. It was thicker than it appeared and very tough. The pathological study revealed a wide variety of changes. There was dense fibrous tissue present, fibroblastic proliferation with edema and infiltration of plasma cells, eosinophils, lymphocytes and polymorphonuclear leucocytes; dilated glandular acini with modified epithelium containing an inspissated mucoid material which showed hyalinization and in some areas calcium deposits were evident. There were also active inflammatory changes with collections of polymorphonuclear leucocytes to the extent of early necrosis approaching miliary abscess formation. New-formed blood vessels were present, also hyperplastic ciliated epithelium, and remember that the membrane appeared almost normal on inspection before it was removed. This patient's recovery was slow, but after a few months the temperature returned to normal, there was a gradual improvement and she has remained free of symptoms.

There is another type of patient who gives a history of having gone to his druggist or family physician off and on for a number of years for cough medicine. He usually has an explanation for his cough. Questioning may elicit a history of susceptibility to persistent colds, post nasal discharge which the patient sometimes thinks is coming from the lungs, and an exaggeration of the chest symptoms during acute colds. The sinus symptoms seem to be ignored, or called "catarrh," to which very little importance is at-

tached by some patients as long as they can breathe through their noses. The physical findings in the nose are indefinite. There may or may not be a muco purulent discharge. The mucous membrane covering the turbinates may appear almost normal in color and consistency. In long-standing cases the mucous membrane loses its smooth appearance and becomes contracted by bands of scar tissue that run in every direction, leaving little islands of normal mucous membrane rising above the contracted portion. One might be justified in passing the nose up as normal were it not known that the patient has a chronic pulmonary lesion and a suggestive history of sinusitis. X-ray of the sinuses will show a polypoid degeneration of the antral mucosa of varying degrees with some involvement of one or more of the other sinuses. We are all familiar with the gross and microscopic appearance of this polypoid type of lining mucosa. Cultures from the surface of this membrane will give one a false impression, but if the membrane is macerated pathogenic organisms will be recovered, usually a staphylococcus or a hemolytic streptococcus. The internist reports these cases as having a chronic bronchitis with beginning bronchiectasis.

There is a group of patients presenting more marked symptoms both in the chest and sinuses. Purulent discharge in the nose and polypi can be seen. A large solitary polypus protrudes from the antrum or smaller polypi in the ethmoids or from the frontal. Thick creamy pus seems to ooze from the meatus continuously and stagnated pus accumulates around the polypi. The patient states that his nose is no worse than usual and readily admits that his head has bothered him considerably. The majority of these cases have by this time developed a severe bronchiectasis. Much can be done toward curing the sinus infection, but the lung is beyond repair.

The number of these cases that have been under the care of rhinologists is amazing. They give a history of having had many operations. The polypi have been taken out of their noses any number of times. A submucous resection has been done, ethmoids have been exenterated, middle turbinates removed, antrums washed, and so on. Everything, even irrigating the antrum, counts as an operation to the patient. These are the patients who support the old adage that one operation on the sinuses calls for another. They are down on all of us and any form of sinus surgery. If we suggest what we term radical surgery after what they have been through, they "blow up." No one can blame them. Many of these individuals would be our staunch supporters if more attention had been paid to the removal of the infection in the sinuses than to relief of local symptoms in the nose.

There is another group of patients who may go to the internist complaining of cough, headache, mucoid discharge from the nose and continuous colds. On inspection you see a hyperemic nasal mucosa with very little swelling and some mucoid discharge in the nose. The mucous membrane of the posterior pharynx, larynx, and even as far down as can be seen in the trachea is hyperemic. X-ray of the sinuses appears almost normal unless the picture is light with good contrast, and then one can see a thickening of the mucous membrane. The shadow shades off into a definite density in the sinus plate.

On the other hand, the chest picture and physical findings are typical of a chronic bronchitis and sometimes a bronchiectasis. The internist will tell you that an upper respiratory infection must be present. We should like to turn these cases over to the allergist, but he does not seem to accomplish more than we do. All of the sinuses appear to be uniformly involved. The ostia are patent. The drainage is good. Those that have been treated for long periods do not seem to have been benefited to any great extent. The chest condition grows progressively worse and the sinus condition remains about the same as far as we can determine. The patient is seldom free from symptoms. Acute exacerbation occurs frequently and on the least provocation. Blood studies do not give any information. The cell counts, both red and white, are within normal limits. The erythrocytes are usually at the lower limits of normal and the leucocytes at the upper. Eosinophilia is not constant. In fact, the most constant finding is the uniformity of reaction in the upper respiratory tract.

SUMMARY

(1) In this group of cases the statement is borne out that an upper respiratory infection is present in practically all cases of chronic nontuberculous pulmonary disease.

(2) The prognosis of the chest conditions depends in no small part upon the possibility of early removal of the source of infection in the sinuses.

(3) Sinus infections mild or severe often exist unknown to the patient.

(4) Patients with chronic pulmonary change

resulting from sinus disease are often treated for tuberculosis.

(5) The importance of early diagnosis and treatment of sinus disease before lower respiratory changes occur cannot be overemphasized.

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DISCUSSION (*Abstract*)

Dr. Conley H. Sanford, Memphis, Tenn.—That the sinuses often act as foci of infection has been definitely demonstrated by the work of Jones and Kistner, Knight, Schwartz, Mullins, Wasson and others. Systemic diseases which frequently result from, or are aggravated by, sinus infection are arthritis, anemia, atherosclerosis, psychoneuroses, hypertension, Bright's disease, pulmonary disease and many others too numerous to mention. It is probable that bronchopulmonary disease is the most frequent complication of chronic sinus infection.

Those accustomed to interpreting x-ray films of the chest can often anticipate the presence of upper respiratory infection by the appearance of the chest film. All radiologists are familiar with the increased hilar and peribronchial shadows present in the chest films of individuals suffering from sinus infection. Dr. Sanders has described to us the routes by which infection is said to gain access to the bronchopulmonary tissues from the sinuses. The internist sees many patients complaining of symptoms characteristic of pulmonary tuberculosis, to find upon thorough study that the fever, cough, loss of weight and general bad feeling are due, not to parenchymal pulmonary lesions, but to chronic sinus infection.

One of the most frequent chest complications of chronic sinus disease is bronchiectasis. With the use of iodized oil, we have found that this condition is far more frequent than was formerly realized. It is my opinion that most cases of sinus infection of long standing are complicated by bronchiectasis. There occurs first of all as a complication of sinus infection an inflammation of the bronchi and bronchioles. This inflammation involves first the lining of the bronchi and bronchioles and then extends deeper into the wall of these tubes. This eventuates in a weakening of the wall, and subsequent increases in intrabronchial tension, such as occur from coughing, result in dilatation or sacculation of the weakened structures. These sacculations become filled with purulent exudate and obviously serve as a secondary focus of infection. Eradication of this secondary focus of infection is very difficult in many cases.

Closer cooperation between the internist and rhinologist is urged in the hope that we may be able to prevent serious chest complications by proper recognition and attention to their primary cause.

AN EFFECTIVE METHOD OF PROTEIN FEVER TREATMENT IN NEUROSYPHILIS*

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The excellence of malaria fever as a form of treatment for general paresis and types of syphilis resistant to ordinary therapeutic methods is now universally recognized. Yet malaria has serious deficiencies. Its mortality rate is gravely high, the fever it induces is not subject to control and it is inconvenient to use, not being practically available except to those who have a ready source of malaria organisms for inoculation. Moreover, in certain cases it is not effective, the patient having a natural immunity to the disease that prevents successful treatment.

These objectionable features have provoked search for a method of treatment that should have the therapeutic value of malaria without its more serious faults. The nature of the curative mechanism of malaria remaining unknown, there is little definite knowledge to guide us in the search for an adequate substitute. But the fever, on account of its apparent relation (whether direct and causal or indirect and incidental) to the benefit derived from treatment, has seemed a promising clue to follow, and it has been with the induction of fever as a main purpose that the therapeutic methods thus far proposed to take the place of malaria, have been conceived.

Such fever-producing substitutes are of three kinds: physical agents, such as hot water baths, electric blankets and diathermy; superimposed parasitic blood infections, such as relapsing fever and sodoku; and substances injected into the body, such as sodium nucleinate, sulphur

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compounds, combined typhoid and other bacterial vaccines. As usually employed, all these have shortcomings. Those of the first group, although relatively harmless and allowing control of the patient's temperature, have the disadvantage of being, as mentioned, purely physical agents, acting largely by physical means, with relatively little of the stimulating effect on physiologic immunity processes that appears to be an important factor in the therapeutic action of malaria. Relapsing fever and sodoku, while relatively safer than malaria, have its other disadvantages and are similarly inconvenient to use. Sodium nucleinate, sulphur compounds and foreign proteins, as applied by current methods, have a disadvantage also. And yet, in consideration of their advantageous features, they seem to offer more hope than other methods of being developed into adequate substitutes for malaria.

COMBINED TYPHOID VACCINE

Bacterial vaccines, especially combined typhoid vaccine, have been employed for years in producing therapeutic fever. In 1926 and 1927 Kunde, Hall and Gerty[1] reported on the use of combined typhoid vaccine in the treatment of general paresis. They used a vaccine diluted with saline so that each cubic centimeter contained 200 million bacilli. Near the end of the course of treatment, doses up to 2,300 million bacilli were used.

Typhoid vaccine has since been shown to have a beneficial influence on the course of general paresis and resistant neurosyphilis and its use has been reported by many authors. In a recent work Kemp and Stokes,[2] after preliminary trials with mixed typhoid, bacillus coli, streptococcus and gonococcus vaccines, discarded the last three and limited the treatment to the use of the mixed typhoid. Sixty-five cases of syphilis were treated, injections having been at first on alternate days and later on two successive days, followed by a day of rest. All patients developed a resistance to the protein, which required steadily increasing dosage. The scheme of dosage found to be most satisfactory was that in which an initial dose of 200 million typhoid bacilli was followed by doses of 400 million, 800 million, and so forth, increasing by 400 million on each successive day. Doses as high as 7,000 million were used. Eighty-seven per cent of the patients reacted with nausea and vomiting immediately after the chill. Three definite contraindications to treatment were mentioned: (1) cardiovascular disease, (2) active pulmonary disease, (3) cachexia and debilitation. The authors state that

> "Careful individual adjustment of dosage and the avoidance of treatment in the face of definite contraindications make this a very safe and controllable form of fever therapy."

This relative innocuousness of foreign proteins, their general availability and the regulability of their dosage, which allows control of the patient's temperature, are advantages that make the desirability of treatment by this means apparent. But while in many cases of paresis and resistant neurosyphilis treatment by foreign proteins has been successful, in general experience it has not equalled malaria therapeutically. It has been frequently observed[3 4] that the benefit from malaria and other types of fever therapy is roughly proportional to the height of the fever. With usual methods of inducing fever by injection of foreign proteins, high temperatures too often are not consistently attainable. Although early in the course of treatment there may be no difficulty in obtaining an effective reaction, after the first three or four paroxysms the dose of foreign protein used often has to be increased so rapidly from day to day that the patient suffers from shock without having fever of more than moderate degree. The failure of foreign proteins to measure up to malaria in therapeutic efficiency may, therefore, be in large measure explainable by their lower capacity for producing fever. For while there is reason to think that the fever itself is not the main factor in cure, it probably is a good index of the extent or efficiency of the immunologic reactions excited by the malaria or foreign proteins in the patient's body. Accordingly, it would seem probable that if fever as high as that produced by malaria could be obtained by injection of foreign proteins, the latter might be made to approach or equal malaria in therapeutic effectiveness.

Since September, 1929, I have made use of a method of applying foreign proteins by which high fever is usually consistently obtainable throughout a full course of treatment. As previously reported,[5] the method consists in giving, for each paroxysm of fever, two separate intravenous injections of combined typhoid vaccine instead of one. After administration of the first dose, which is of a size calculated to cause slight fever, two or three hours is allowed to elapse for the patient's temperature to reach its

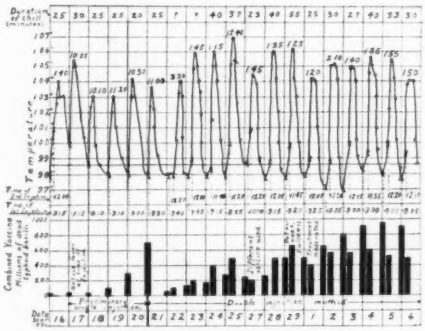
height, this point being determined by taking the temperature every twenty minutes. At the peak of the fever induced by the first dose, the second one is given. Following this second dose, which seems to "explode" a physiologic charge created by the first, the patient's temperature usually rockets to the levels characteristic of malaria: 105, 106, or even 107°.

IMPORTANT DETAILS OF TECHNIC

Experience gained in the use of this method indicates that by paying attention to certain details of technic better results can be obtained. Before starting treatment the patient should be examined, as recommended by Kemp and Stokes, for evidence of serious cardiovascular or active pulmonary disease. If either is present, treatment, if given at all, should be carried out with unusual caution. Combined typhoid-paratyphoid vaccine in concentrated form (1,000 million typhoid bacilli, 500 million each of paratyphoid A and B per c. c.) should be used. A sufficient quantity of the particular brand of vaccine to be used (usually 20 c. c.) should be on hand to obviate interruptions in treatment and the uncertainty about dosage that results from changing to a different vaccine during the course of treatment. Although it is not necessary, it is probably best to start with single injections for two or three days in order to observe the degree of the patient's reactivity and to get a basis for estimating dosage. Beginning doses of approximately 50, 100 and 200 million bacilli on successive days are satisfactory, but these should be varied to fit individual reactions. After the preliminary single injections, double injections can be started, using much smaller amounts of vaccine. The size of the doses used should be increased from day to day sufficiently to insure fever reactions of 105 or 106° or over. Large doses are not usually required to obtain such reactions, but if necessary they should be used and doses as high as two or three thousand million or even more may be needed. The temperature following the first of the daily double injections should be raised to about 99.5 or 100°. Treatment should be given daily if possible, but a rest period may be necessary every three or four days. The time of onset and the duration of chills should be recorded and the blood pressure taken daily. If a chill lasts over twenty-five minutes the patient must be carefully watched for signs of cardiac failure. The course of treatment preferably should be continued to a total of 18 paroxysms and should be followed by a recuperative rest period of several weeks. Following it the patient should be advised to eat extra meals to regain weight and strength.

ILLUSTRATIVE CASES

Case 1.—A man, aged 33, had suffered from lightning pains in the lower extremities since 1925. His health in other respects had been fairly good. He was somewhat underweight and there were signs of parenchymatous neurosyphilis of tabetic type. In August, 1928, the Wassermann reaction of the blood was strongly positive. The spinal fluid showed: Wassermann (Kolmer) reaction 4441—, 38 cells, colloidal gold test 0000021000. He was given systematic treatment with arsphenamine and mercury until July 12, 1930. At that time the blood Wassermann reaction was still strongly positive and the findings on the spinal fluid were: Wassermann (Kolmer) 44431, cells 42. He was advised to have intraspinal injections of serum, but refused. On his return in September, 1932, he was given a course of fever treatment as shown in the chart below.



This chart of the treatment given in *Case 1* is largely self-explanatory and is shown because it affords a good illustration of the technical details of the double-injection method of foreign protein fever treatment. The preliminary treatment by single injections was carried on for experimental purposes longer than is ordinarily necessary. At one point, September 29, the patient showed signs of cardiac failure and it was considered advisable to interrupt treatment, resuming it after a day's rest with milder reactions. Thus a demonstration is furnished of the advantage of foreign proteins over malaria, which cannot be so controlled.

Case 2.—A woman of 37 years had been under treatment for syphilis for several years. She had had a comparatively large amount of neoarsphenamine and mercury, but in spite of this had lost weight, become more nervous and for a year had been troubled by fits of excitement, delirium and unconsciousness. These attacks had become more frequent during the six months before examination, coming on with little warning every ten days or two weeks. During most of them she was maniacal and had to be controlled forcibly. The patient was 4 feet, 11 inches in height and weighed 110 pounds. Physical signs of neurosyphilis were lacking. The Wassermann reaction of the blood had been consistently strongly positive since August, 1929. An examination of the spinal fluid was made

April 17, 1931	70 million	103.6	Preliminary treatment by single injections.	
April 18, 1931	140 million	103.0		
	First Dose	Highest Temp.	Second Dose	Highest Temp.
April 20, 1931	25 million	99.0	25 million	104.6
April 21, 1931	35 million	100.6	35 million	104.6
April 22, 1931	50 million	98.6	90 million	105.2
April 23, 1931	90 million	99.0	140 million	104.8
April 24, 1931	200 million	99.0	380 million	105.0
April 25, 1931	400 million	100.0	500 million	104.0
April 27, 1931	100 million	98.5	150 million	*101.0
April 28, 1931	550 million	99.9	600 million	106.0
April 29, 1931	750 million	100.00	750 million	106.2
May 5, 1931	1700 million	99.1	1800 million	105.8

Present Method by Double Injection.

*Following a third dose of 200 million, two hours later, the temperature rose to 104.8°.

December 14, 1930. It showed: Wassermann (Kolmer) reaction 44442, 32 cells, colloidal benzoin reaction 333 330 033 333 200 (a strong reaction in the paretic zone). Treatment was begun in April, 1931, and consisted of a series of eighteen paroxysms of chill and fever. Following are excerpts typical of the record:

There was a loss of twenty-five pounds in weight during the treatment. No other treatment has been given since this course was completed.

A Wassermann test of the blood made October 14, 1932, was reported "two plus." Tests of the spinal fluid at that time showed: Wassermann (Kolmer) 41 — — —, cells 3, colloidal benzoin 123 233 333 321 000, indicating marked change for the better. The clinical improvement has been even more striking. In the eighteen months since the treatment was finished the patient has not had a single attack like those from which she formerly suffered; she has gained 51 pounds in weight (being now on a self-imposed reduction diet) and appears to be in excellent general health.

Case 3.—A very obese woman had been troubled by headache for a year and had been given treatment with arsphenamine, mercury and intraspinal injections of blood serum for neurosyphilis with little or no benefit. Aside from pallor and blurring of the right optic disc and slightly constricted visual fields, there was little objective evidence of neurosyphilis.

When the patient was first seen, in October, 1930, the Wassermann and Kahn tests of the blood were strongly positive and examination of the spinal fluid showed: Wassermann (Kolmer) reaction, anticomplementary (444441), 186 cells, colloidal benzoin curve 113 313 333 333 110. In May, 1931, she was put through a course of eighteen paroxysms of chills and fever, but her temperature could not be raised above 103.2°. Notwithstanding this, the chills were violent and prolonged, averaging one hour and five minutes in duration. In March, 1932, she was given a second course of treatment, with similar results. No other treatment has been given. A re-examination of the spinal fluid November 3, 1932, showed: Wassermann (Kolmer) reaction 44 — — —, 1 cell, colloidal benzoin curve 112 330 001 333 331. The patient's headache virtually disappeared after the first course of treatment and is no longer troublesome.

Of three other cases, previously reported, one patient, apparently well when last seen, has disappeared from observation. In the other two cases the patients remain in good health. One of these is a woman who had had an asymptomatic neurosyphilis and whose serologic tests returned to practically normal following treatment. The other is a man who had had signs of early paresis and who had aborted therapeutic malaria after six chills without receiving benefit from them. Following this the patient had been

Case No.	Av. Time Between Injection and Height of Fever		Average Duration of Fever After Second Injection			Av. Height of Temp. After Second Injection	Extreme Height of Temp.	Main Chills	
	After First Injection	After Second Injection	At Height	Within 1° of Height	Over 102°			Time Between Injections and Onset	Duration
1	2 h. 40 m.	1 h. 35 m.	20 m.	1 h. 15 m.	1 h. 50 m.	105.2	106.8	45 m.	35 m.
2	2 h. 15 m.	1 h. 55 m.	28 m.	50 m.	2 h. 0 m.	105.0	106.2	?	?
3	2 h. 10 m.	2 h. 10 m.	20 m.	1 h. 0 m.	?	102.1	103.2	34 m.	1 hr. 5 m.
4	3 h. 30 m.	?	?	?	?	105.0	105.1	?	?
5	2 h. 0 m.	1 h. 50 m.	35 m.	2 h. 0 m.	3 h. 20 m.	105.2	106.8	55 m.	35 m.
6	3 h. 30 m.	1 h. 40 m.	30 m.	1 h. 20 m.	2 h. 30 m.	104.3	105.6	53 m.	27 m.
Average	2 h. 40 m.	1 h. 50 m.	26 m.	1 h. 15 m.	2 h. 25 m.	104.5	105.8	45 m.	40 m.

given two courses of treatment by the double-injection method, using combined typhoid vaccine. He now weighs over 200 pounds, having gained from 172 pounds which he weighed when first seen. He writes that his greatest trouble is the lack of a job.

DATA ON FEVER AND CHILLS

Average figures relating to the fever and chills are presented in tabular form at the bottom of preceding page. Such average figures are of questionable value in drawing conclusions, but are given here to furnish a general view of the treatment.

SUMMARY

(1) A more effective method of producing therapeutic fever by intravenous injection of combined typhoid vaccine is presented.

(2) By means of this method fever consistently higher than that produced by ordinary methods is obtainable.

(3) Treatment by this method is less dangerous than by malaria, is more convenient and widely available and at the same time probably makes use of bodily immunity reactions similar to those induced by malaria.

(4) Treatment of patients with resistent neurosyphilis by this method has been followed by improvement equal to that observed in similar cases treated by malaria.

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DISCUSSION (*Abstract*)

Dr. J. Lee Kirby-Smith, Jacksonville, Fla.—As Chairman of this Section at the 1927 meeting, I read an address entitled "Are We Dermatologists Syphilologists?" in which I informed you that I had obtained information that few dermatologists treat neurological syphilis.

Properly speaking, a report of the kind that we have just had would be dealt with more appropriately by internists or neurologists. I wish to bring to your attention a very recent report of Dr. Mark F. Boyd, Director of Malaria Research of the Rockefeller Foundation, and Dr. Stratman-Thomas, who have for some time conducted experimental studies on naturally induced malaria in the treatment of paresis, at the Florida State Insane Asylum.

A few weeks ago Dr. Boyd presented his subject in detail before the annual meeting of the Florida East Coast Medical Association. He states, "The general belief at present is that immunity to malaria infection is largely cellular, with the principal defensive role played by the cells of the reticulo-endothelial system. It appears likely that the benefits of malaria therapy in paresis are attributable to the stimulation of the cells of this system which may perhaps attack the spirochetes in their perivascular locations in the brain tissue. If these views are correct, very little of the benefits are attributable to any increase in body temperature that occurs as a result of a malaria attack. Consequently, it hardly appears likely that physical or non-specific measures for an elevation of body temperature are likely to serve as adequate substitutes for malaria therapy."

If one uses their technic of inoculation with benign tertian malaria, malaria therapy can be employed with a negligible risk to the patient. Of their 85 cases, including all of those patients in the first 8 series, all are alive except 4, in 3 of whom death was produced by paresis while in the fourth termination was produced by an intercurrent septicemia. In none of these four was death in any way influenced by the malaria inoculation, and the general improvement from treatment was striking.

From this report you will gather that there is a marked divergence of opinion. Dr. Nelson calls your attention to the grave mortality rate, while Dr. Boyd's experience is that the treatment is given with a negligible risk to the patient. Unquestionably the malaria treatment would require skill and ability in utilizing the proper mosquito to induce blood reaction in the treatment of spinal and cerebral syphilis.

No doubt the intravenous injections of typhoid vaccine are simpler and bring about the same cell shock as that produced by artificial malaria.

Dr. Hugh J. Morgan, Nashville, Tenn.—I do not think that we can say that we know the mechanism by which malaria induces remission in paresis, nor can we say with finality that the mechanism is the same in malaria therapy and diathermy or other forms of induced fever. It is interesting to note that Cunningham, Harris, Tompkins, and I have shown that in experimental syphilis the clasmatocyte, or large mononuclear phagocytic cell, plays a role in spontaneous recovery from active lesions. These cells are present in the lesions and colloidal agents, used to stimulate their activity, hasten resolution of the lesion. This same mechanism has been suggested as the one which operates in malaria, since the latter disease is known to have a stimulating effect upon the clasmatocyte.

Dr. J. Richard Allison, Columbia, S. C.—In the State Hospital in South Carolina, in the treatment of certain types of neurosyphilis, we have used both malaria inoculations and typhoid vaccine therapy. We feel that the vaccine is as effective as malaria and is the method of choice. Dr. Nelson's technic, by which he is able to maintain a high temperature reaction over a longer period of time is a distinct contribution to fever therapy in the treatment of neurosyphilis. The question of the mechanism of fever therapy has been brought up. I think it has been well established that it is not the temperature or the chill itself that produces the desired effect but that it is a stimulation of the

reticulo-endothelial system and an increased phagocytosis.

Dr. Taliaferro Clark, Washington, D. C.—Dr. Nelson's paper is of interest in view of the very prevalent impression among clinicians of repute that the malaria treatment of general paralysis gives better results than any other form of treatment. Although the mechanism by which malaria operates to bring about remissions in general paralysis is still a mooted problem, there is increasing evidence that neither the chill nor the fever alone is responsible for the beneficial effects, but rather a stimulation of the reticulo-endothelial system and increased phagocytosis. Reported observations by Bruetsch, Central State Hospital for the Insane, Indianoplis, strongly confirm this action. Within the past year the U. S. Public Health Service has instituted the malaria treatment in several of its hospitals, not only for the treatment of general paralysis, but also of cases of early neuro-involvement as manifested by abnormal spinal fluids. Moreover, comparative studies have been undertaken in order to determine the relative effect of treatment by diathermy, fever induced by heat cabinets and malaria at various stages in neuro-involvement.

The increasing number of applications for malaria material made to the United States Public Health Service following the publication of Wagner-Jauregg's experience in 1917 is responsible for the establishment of a central supply depot at Columbia, South Carolina, through the splendid cooperation of the State Hospital. In addition to supplying infected blood and mosquitoes for inoculation, studies are being carried on at this station to determine the viability of the parasite under actual transport conditions. Recently studies have been undertaken to determine the feasibility of inducing malaria by inoculation with an emulsion of sporozoites dissected from the salivary gland of infected mosquitoes and the duration of viability of the sporozoites in emulsion under varying conditions.

Finally, may I not call attention to the well established principle that untreated tertian patients who proceed to spontaneous recovery as a rule are refractory to inoculation with the same strain. However, this resistance may be overcome by a strain of the tertian parasite obtained from a different source or by the same strain after a course of antimalarial treatment. There are certain individuals, notably among the negroes, who are refractory to the tertian parasite, but not to the plasmodium of malaria. The Public Health Service has been successful in establishing a quartan strain at the Columbia, South Carolina, station for the treatment of refractory cases.

Dr. S. S. Marchbanks, Chattanooga, Tenn.—The elevation of temperature can be obtained very simply and safely by diathermy. I am wondering if the essayist or any of those present has tried this method.

Dr. Nelson (closing).—As Dr. Morgan said, the nature of the therapeutic mechanism of malaria remains unknown and opinions about it can hardly be more than speculative. There is one interesting feature of malaria and foreign protein therapy which suggests that these two may have a similar mode of action in the body. Both produce a severe chill, which is followed by fever. In this respect they differ from physical fever-producing agents, such as diathermy, which do not call forth the chill. It is possible that the chill would be a better index than the fever of the benefit derived from treatment if there were an accurate way to measure its severity.

I believe the effect of the double injections is not simply that of cumulative dosage. The first dose appears to create in the body a condition of increased reactivity, which the second dose "explodes" with very much greater effect than is possible by single doses as large as both put together.

THE SCLEROSING TREATMENT OF VARICOSE VEINS*

By H. R. BLACK, M.D.,
and
H. S. BLACK, M.D.,
Spartanburg, S. C.

The treatment of varicose veins, whether surgical or otherwise, has never been entirely satisfactory. Following the employment of sclerosing agents which are given intravenously, the percentage of recurrence (5 per cent) is much less than that following operations.

In 1851, Pravaz, using a solution of ferric chloride, made intravenous injections, expecting to cure arteriovenous aneurysm. He did not succeed, but had many septic embolic sloughs and thrombi. Three years later, Sosquet injected iodotannic acid solution. The method was very painful and the patient was incapacitated, yet he observed the fact that a clot formed in the vein within twenty-four hours. In 1894 Delore, as a result of the sclerosing treatment of veins, demonstrated such changes as a destruction of the intima, hemorrhagic changes in the wall and finally obliteration of the lumen of the vein by formation of a clot and an ingrowth of connective tissue element. Between the years 1900 and 1910 various solutions such as 5 per cent phenol, 1 per cent iodine and potassium iodide, as well as arsphenamine, were introduced as sclerosing agents, but none of them proved entirely satisfactory.

Linser, in 1911, injected 1 per cent solution of mercuric chloride intravenously for the treatment of varicose veins with very good results, except for the fact that some of his patients later suffered from some degree of mercuric poisoning. Hanschell, two years later, used a solution of 6 per cent quinine. Sicard, between the years 1916 and 1918, experimented with luargol and sodium carbonate in 5 to 15 per cent solution, but these were not satisfactory because of resulting necrosis and the incapacitation of the patient. In 1921, Linser discontinued the use of his mercuric salt and employed a 15 to 20 per cent solution of sodium chloride. In the same year, Nobl used 50 to 60 per cent glucose, and Generini introduced 12 per cent quinine hydrochloride with 6 per cent urethane. This, in our opinion, was the best solution until 1930, when Wright, of London, employed sodium morrhuate in 3, 5 and 10 per cent concentration. Until this solu-

*Read in Section on Railway Surgery, Southern Medical Association, Twenty-Sixth Annual Meeting, Birmingham, Alabama, November 15-18, 1932.

tion was introduced, all of the injected solutions with the possible exception of invertose produced slough if they happened to escape outside of the veins, and they likewise produced varying degrees of reaction either local or systemic. In sodium morrhuate we have, in our experience, the ideal sclerosing agent. It does not produce either a local or a systemic reaction; neither does it produce a slough if it escapes outside of the vein, but it does produce a sclerosis. In the small veins which are difficult to inject we use sodium morrhuate altogether, but in those which are easily identified we use quinine and urethane.

Any of the above mentioned sclerosing agents which are injected intravenously produce a cloudy swelling of the endothelium, which is followed by proliferation. From the proliferated cells fibrous tissue arises in the mass in which blood cells are lodged. From this a thrombosis forms, which finally results in the vein's becoming a fibrous cord.

The venous system, as you recall, is composed of two sets of veins, the superficial and deep, and it is the superficial veins that are treated. These veins vary in size from the so-called spider web to the large tortuous and almost aneurysmal type. It is not our intention to discuss the etiologic factors that produce varicose veins, but there are some very definite factors to be remembered before injecting them.

The patient should be subjected to a complete examination such as we would make before a surgical operation. What folly it would be to inject varicose veins produced by bone sarcoma or some intra-abdominal lesion!

Patients with marked hypertension and arteriosclerosis *per se* or associated with cardiorenal disease, in our opinion, are best treated by wearing a bandage, though some cures have been carried out successfully. Acute or recent phlebitis and acute infections are contraindicated likewise. It is better not to treat pregnant women, especially with the quinine and urethane solution. Neither should one use this solution for patients who have an idiosyncrasy to quinine.

Before injecting any superficial vein, one should know whether or not the deep veins are patent. If they are thrombosed, a definite contraindication is present. The Trendelenburg test determines this for us. The patient is placed in a recumbent position and the extremity elevated to empty the veins as nearly as possible. Pressure is then made on the first portion of the saphenous vein and the patient stands. If the superficial veins fill immediately it is evident that the deep veins are not functioning. Dixon gives a sure method, which is to have the patient wear a light bandage for several hours, compressing the superficial veins. If this causes great discomfort and pain, it is supposed that the deep veins are not functioning.

Before the injection, we thoroughly cleanse the leg with an antiseptic solution and have the patient stand on the examining table until the veins are filled. This allows easy identification of them. We have not deemed it necessary to use tourniquets nor to have the patient in the recumbent position during injection because it has been shown (Dixon and others) that the thrombosis occurring after the injection forms mostly downward from the point of the injection, which in turn suggests that the flow in large varicose veins is sluggish and in certain cases it is in the reverse direction from the normal flow. In that case the tourniquet would not prevent an embolus. We usually start injecting high up the leg and inject downward, running 1 to 2 c. c. of solution of quinine hydrochloride and urethane, or from 2 to 6 c. c. of a 5 or 10 per cent solution of sodium morrhuate, depending upon the size and location of the vein. In the spider web type we use altogether the sodium morrhuate solution, for if some of the solution gets out of the vein there is no inflammatory reaction. Immediately after the injection a tight bandage is applied and the patient is asked to remain quiet for an hour. He is instructed not to massage or to rub the limb under any condition, and he is then permitted to return to work. Injections are made two or three times a week, the number required to cure varying, of course, with the individual case.

Varicose ulcers are found most frequently in workmen, and any condition which produces a break in the lymphatic or vascular circulation may cause an ulcer. These, of course, are most commonly found on the anterior surface of the leg between the knee and ankle and result from the following causes: varicose veins; phlebitis of various types; trauma, such as fracture which interferes with the venous circulation and infections in which the lymphatic and vascular bed is involved and supplanted by fibrosis. In the past these ulcers have been treated with little success by strapping with adhesive, Unna boot, cauterization, curettement, various antiseptics, ointments, surgical excision, and in some cases by excision with skin grafting. Smith states that any treatment which will compensate for the loss of vascular balance will cure this condi-

tion. Sclerosing of the varicose veins in which the ulcer is superimposed, and then applying pressure constantly to maintain equilibrium in the vascular system, will cure practically every one of these ulcers.

The pressure may be maintained by the use of an elastic adhesive bandage, plaster cast or Unna boot. Those patients with a very small ulcer have been treated by injections of the vein in the vicinity of the ulcer and if possible at the margin of the ulcer. The other veins present are also injected. In the small ulcers, healing is as a rule rapid. In case of large ulcer, besides the injections, we bandage the ulcer, using the elastic adhesive bandage, which is applied directly on the ulcer. In most cases we change the bandage every 10 to 14 days, occasionally at longer intervals. In some cases where the drainage from the ulcer is profuse it may be necessary to rebandage as often as every 5 to 7 days. In cases where there is a great deal of swelling, we advise rest in bed for a few days before injecting and bandaging.

Those ulcers of the leg in which no visible varicosities can be seen, but the veins are in the muscles, are best treated by bandaging only. There are some recurrences of the ulcer in these cases. When we notice the return of symptoms such as eczema, cyanosis and edema, the bandage should be reapplied. Occasionally skin grafting is necessary. Braum suggests using small linear strips of skin 3 mm. in diameter and inserting them into the granulating area after it has been anesthetized with local anesthesia.

Because of the fact that patients with varicose ulcers are treated by the injection method without putting them to bed; that the number of recurrences is lessened; that the time of healing of the ulcers is shortened; that the time necessary for the veins to disappear is lessened; and because of the lessened cost, it behooves all of us who are not using the injection method of treating varicose veins and ulcers to try it.

Mary Black Clinic

DISCUSSION (*Abstract*)

Dr. Edward T. Newell, Chattanooga, Tenn.—I have not used sodium morrhurate for the sclerosing of varicose veins, but have confined most of the injections that I have made to quinine hydrochloride with urethane. This is put up in 2 c. c. ampoules, by one of our leading pharmaceutical houses. After this solution is injected into the vein, provided none of it is allowed to escape as the needle is withdrawn, you will obtain, in a very high percentage of cases, excellent results.

In very large varicose veins, this solution may be so diluted that it does not irritate the endothelial lining of the vessel sufficiently to cause the obliteration that one seeks; and in these cases we have been using 20 per cent glucose in 5, 10, and 15 c.c. injections with excellent results.

There are a number of solutions that will sclerose veins.

If one confines his practice to one of the concentrated solutions for the smaller veins and to glucose or 15 per cent saline solution for the larger veins, he will get better results than by the indiscriminate use of the large number of sclerosing solutions.

The injection treatment of varicose veins is another of the triumphs of a simple procedure in the eradication of a condition that formerly required major surgery; and it is one of the most beneficent procedures that is now used by the surgical profession. The operative mortality is 7 per cent, the sclerosing mortality less than 1-150,000. In ulcer, Unna's boot is a great adjunct.

CEREBRAL HEMORRHAGE: MEDICAL ASPECTS*

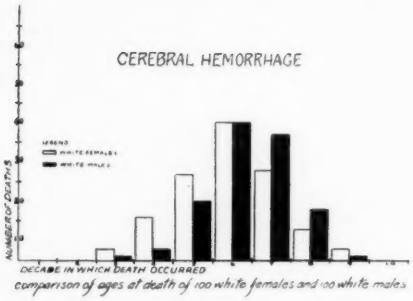
By CHAILLE JAMISON, M.D.,
New Orleans, La.

Cerebral insults of any kind are usually characterized by such dramatic and unusual changes in the afflicted individual that our attention and interest are focussed on the event and its tragic sequelae rather than on the circumstances and changes which make the disaster possible.

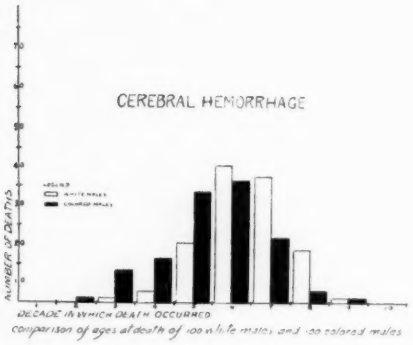
The study of these changes may lead to means of their prevention, or at least to delay in their development, while contemplation of the wreck in which they result can and has led to very little. Apoplexy, a term usually used to imply cerebral hemorrhage, may include embolism, purpuric bleeding, the minute hemorrhage of infectious disease, and so forth, but such forms are rare and dependent upon specific diseases. The changes in syphilis, as it affects the brain, are a common cause, but are also only part of a specific disease and should be treated separately. This communication is restricted, as far as possible, to a consideration of hemorrhages from arteries of larger or smaller size, as such hemorrhages are responsible for apoplexy in the generally accepted sense, that is, "a stroke."

Postmortem examination of the brains of apoplectics shows certain changes in the arteries: sclerosis and atheroma, aneurysm (miliary and those of larger size), and thrombosis. These

*Read in Section on Medicine, Southern Medical Association, Twenty-Sixth Annual Meeting, Birmingham, Alabama, November 15-18, 1932.


CEREBRAL HEMORRHAGE
NUMBER OF DEATHS
DECADE IN WHICH DEATH OCCURRED
comparison of ages at death of 100 white females and 100 white males

Graph 1


CEREBRAL HEMORRHAGE
NUMBER OF DEATHS
DECADE IN WHICH DEATH OCCURRED
comparison of ages at death of 100 white males and 100 colored males

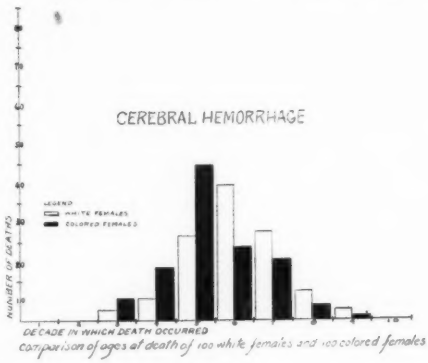
Graph 2

arterial changes are worthy of the closest scrutiny because it can be granted that normal arteries never rupture under any pressure possible within the vascular system, and neither does thrombosis take place within a vessel the walls of which are normal.

For many years aneurysms of the miliary type were regarded as the most prolific source of hemorrhage into the brain, though it was pointed out by many observers that this was not the case. These dissecting aneurysms are dismissed by Kaufman as of no importance in the etiology of cerebral hemorrhage. Larger aneurysms may result from the yielding of an area of the arterial wall damaged by atheroma or congenitally weak. These are not uncommon in the larger arteries at the base of the brain and are an occasional source of hemorrhage. Sclerosis and atheroma are the most important changes. Atheromatous patches cause a localized weakening of the arterial wall, which it is thought may easily rupture under pressure quite common within the vascular tree; and both sclerosis and atheroma cause a narrowing of the arterial lumen and a roughening of the walls, which are ideal for the occurrence of thrombi.

When thrombosis occurs in a vessel the area which it supplies softens. Through this softened area may course rather large vessels, more or less degenerated, and such vessels, when deprived of the firm support of surrounding healthy tissue, easily rupture, and gross hemorrhage results. Some authorities consider thrombosis a very constant preliminary to hemorrhage into the brain, and such thrombosis may have occurred days, weeks or months prior to the major phenomenon. The part which increased coagulability of the blood and decreased velocity of the circulation may play in thrombosis, and thus in cerebral hemorrhage, is given very little attention in the current texts.

The clinical recognition of impending apoplexy is largely a matter of guess-work. Reliance is placed on a certain group of symptoms such as headache, tinnitus, vertigo and "spots before the eyes;" and on a group of physical signs which comprise hypertension, thickened peripheral arteries, changes in the arterioles of


CEREBRAL HEMORRHAGE
NUMBER OF DEATHS
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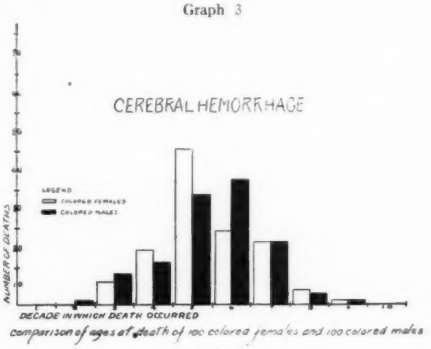
Graph 3


CEREBRAL HEMORRHAGE
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comparison of ages at death of 100 colored females and 100 colored males

Graph 4

the retina, and the state of senility existing in the patient. Persistent and repeated epistaxis often gives timely warning. Considered of particular significance is the combination seen frequently in chronic nephritis, of hypertension, cardiac hypertrophy and arterial degeneration, to which is particularly applicable the oft-repeated aphorism, "The strong heart breaks the weak artery." In a given case of hypertension reliable signs and symptoms are available for the prediction of impending heart or kidney failure, and opportunity is afforded for the institution of treatment. In the state of present knowledge this is not true of cerebral hemorrhage. Every medical man has observed patients who show the so-called signs and symptoms of a pre-apoplectic state go for months and years without the anticipated catastrophe; and many have had the disagreeable experience of reassuring other individuals, only to have them unexpectedly stricken shortly after the physician's examination. Much of this uncertainty seems to result from too much prognostic dependence upon blood pressure elevation, nearly all of the teaching emphasizing that hypertension plus the increased intravascular tension resulting from sudden emotion or from sudden physical exertion is a *sine qua non* for rupture of a cerebral vessel. Such a conception does not satisfactorily explain those deaths which occur from apoplexy during sleep, or during the pursuit of some quiet occupation. Such studies as have been made of the patient's occupation at the time of the stroke indicate that over half of those stricken were either sleeping or engaged in a quiet pursuit. Some emphasis is placed on the effects of race and family tendency.

I have attempted a comparison of negro and white patients (*Graphs 1, 2, 3* and *4*), hoping to throw some light on this phase of the question.

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DISCUSSION (*Abstract*)

Dr. Groesbeck Walsh, Birmingham, Ala.—We are indebted to Dr. Jamison for again directing our attention to the fact that cerebral hemorrhage is not an isolated accident. Apoplexy has been a favorite method of removing characters from various scenes both in books and on the stage. It reflects a common opinion that these individuals are in an excellent condition of health up to the time the fatality occurs. We know, of course, that this is not so, and that the terrain has been prepared years before these individuals make their exodus. I have been very much chagrined and shocked at times to observe the same series of events to which Dr. Jamison directs our attention, namely: the unexpected duration of life in individuals who give the impression that they are likely to develop a cerebral hemorrhage before they get out of our office; and, on the other hand, that we receive news from a family that one of its members has suffered "a stroke" shortly after we have assured them that such an event was extreme'y unlikely. The development of pathological conditions in blood vessels of the brain sufficient to produce an embolus or a hemorrhage must take years, and, unfortunately, they give only a suggestion of their presence.

Dr. Cabot Lull, Birmingham, Ala.—It is a very common experience in hospital and consultation practice to have to treat patients with cerebral hemorrhage, without the opportunity to ascertain their past history. Quite often the patients are brought in in a stupor and their deaths are certain in a few hours or days, this in spite of the physician's best efforts.

In all such cases we should insist on postmortem examination. Often when doubt is expressed as to the actual cause of death and the importance for the filing of insurance or other claims of having this determined is stressed, one can secure consent for autopsy.

In some cases I believe we should even refuse to sign death certificates and turn the matter over to the coroner.

In some, if not in all cases, the diagnosis would be established and certainly much information of scientific value would be obtained.

MENTAL HYGIENE OF THE INVOLUTIONAL PERIOD*

By HENRY DASPIT, M.D.,**
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I have been impressed for a number of years with the dearth of information in current literature, as well as in psychiatric texts, dealing with the mental needs of the involution, presenium and senectitude. Tons of articles, many of them impractically fantastic, having to do with the behavior problems of childhood and "the pitfalls of adolescence" are served us, but the psychologic phase of the closing years of life is most often dismissed with a small remark and almost a casual wave of the hand.

The general attitude appears to be that you have really passed the productive period of life and it is just too bad. Your physical machine

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**Dr. Daspit died December 19, 1932.

is wearing out and you are paying the unescapable penalty. There is not very much to do about it. As a result of this attitude the great majority of us become accustomed to minimize the psyche and look too much on the organic condition at this time. Stress is put on the active use of testicular and ovarian extracts in this, the period of decadence of glandular action, but little thought is seriously given to anything like a consideration of improving the patient's mental attitude toward his changing situation. Understand that the great importance of the organic changes is appreciated and that, in all probability, mental integrity itself is dependent on organic fitness. Nevertheless, if we are to meet our obligations as physicians, and this even approximately, we must give proper attention to the mental health as well as the physical welfare of all our patients. Even psychiatrists themselves are prone to become lopsided and lose their sense of proportion in giving all attention to the problems of childhood and adolescence.

In the background of nearly all unhappiness and adjustment difficulties stands fear. This fear is generally a conscious or unconscious feeling of a real inadequacy on the part of the individual to meet some actual or fancied difficulty. Without it there would be no psychoneurosis at any stage. The Freudians have probably fallen into the error of allowing too much attention to the content and have overstressed sex, as race preservation, rather than fact, as self-preservation. It is reasonable to assume that the adolescent or young adult with his world before him and prompted by the predominance of active and exciting forces with natural submission to impulse should be less susceptible to fear or consequence and self-censure. As age advances and the individual, male or female, passes through the climacterium these driving forces, unquestionably endocrine in motivation, lessen and, with the narrowing of his horizon, social and physical, he goes over the crest of the hill and with the sun on his back approaches the shadows. At this phase, major adjustments to new conditions are demanded and these adjustments easily balance and frequently outweigh those encountered in the transition from adolescence to adulthood. Quite certainly more ghosts exist in the shadows than in the sunshine. It is reasonably much more difficult to adapt oneself to deprivation when one has previously enjoyed luxuries. Psychologically it is a development somewhat analogous to that of the fellow in the shadow of the rope, who reacts into a situation psychosis as the result of the unescapability of his difficulty.

Admitting that a psychosis is merely a flight from reality into a new and hoped for better world and that the probability of its activation is in proportion to the stress as related to the inherent tensile strength of the individual, it is easily understandable why the accepted peaks of the incidence of mental disease should be in adolescence and the involution. Many fundamentally psychotic people (or should we say psychopathic?) pass into adult life without showing psychotic shifts. They are usually reasonably well protected during their transition into adulthood and accordingly do not break. When the difficulties of the involution or presenium appear, being without adequate personal resource psychically and being deprived of their buffers, parental or financial, there is but one thing to be expected. They will defend themselves either with a minor or a major psychosis. Quite naturally the psychosis will show the mechanism of their personality make-up.

I do not know what accord will come from other psychiatrists, but it seems to come within my experience to encounter quite a few schizophrenic reactions, developed psychotic entities, first becoming evident during or after the climacterium. A careful analysis of these usually shows that the patients have then been called on to make their first unassisted adjustment. It is surprising how many of these schizoids get through the adolescent sieve. These, with probably the paranoids and certainly the manic-depressives, form our so-called essential or functional, spare the term, psychotics. The enormous number of instances of disturbances of mood amounting to disabling psychoses in latter life is too apparent to require other than remark.

While we should certainly not be blind to our obligation of laying the foundation in today's children for the best possible character and personality to meet tomorrow's difficulties, we should also realize that in our contacts with today's adults we are confronted with the aged soon-to-be. Superficially they may appear to be correctly in tune with their environment and this may be quite correct in general for their particular age, but what have they to meet the unescapable limitations of advanced age? Should economic security be removed by the death of a mate or unanticipated financial disasters, only too frequent today and in recent years, what have they to call on?

Within the last few years economic depres-

sion has added unprecedented difficulties in new adjustments to forced alterations in our living standards. I have noted two things. One is, I think, accepted, while the other may be questionable. The first is the marked increase in the suicide rate; the second the marked increase in first admissions to our psychopathic hospitals of persons fifty and over, and the relatively small increase in the first admissions of those under thirty.

While factors other than financial loss are to be considered in suicide, which is, after all, only a form of escape from a difficulty, it is interesting to note that between 1925 and 1930 the increase was 46 per cent in white males and 40.5 per cent in white females. There was practically no increase in the suicide rate of negroes.

Like all psychiatrists, I am struck with the barrenness of personal resource encountered in those who become psychotic after the climacterium. This naturally does not pertain to the period of the activity of the psychosis. Just as our greatest task is to construct for the patient a different attitude toward his world at this period and to provide diversional activities not dependent on the bank account, so should we view every patient in adolescence and adulthood, whether they come under our care as psychic or physical problems. Here must function every practitioner of medicine, as there will always be too few psychiatrists to do more than scratch the surface. A very simple example may be cited as follows: some years past, we were receiving in the City Hospital for Mental Diseases far too many patients from an old folks home, at least one monthly. As a rule they did badly in the atmosphere of the hospital. A staff member went to the institution in question to investigate and found that these old people were encouraged in no diversional activity or work. Suggestions were made and active steps taken to correct this idleness with the result that we now do not have an admission from this home more than once or twice yearly.

Those who come under psychiatric observation, either in the institution or the office, represent the disasters which by proper forethought could have been avoided in quite a large number of instances. We are dealing with a patient whose early conditioning has in no way whatever been influenced by our modern ideas of child handling and it will be years, if not generations, before such training effect influences a large part of our social group. I may only repeat a previous statement to the effect that, while remembering the necessity of proper child psychiatry, we should be keenly alert to the need of better mental hygiene in the adult period as preparatory to the demands of the involution. Unfortunately, I have no set formula or procedure to suggest and may only encourage all psychiatrists to keep this phase of the problem before the general practitioner through those medical publications which usually come to his desk. Much is written in the highly specialized journals touching on this matter, but not one practitioner in a hundred ever sees them. Fortunately, it appears that our medical educators are beginning to awaken to the need of the appreciation of psychologic problems in all patients even where there is no surface indication of a possible mental factor. In Tulane clinic activity, the student is required in his handling of the patient assigned to report as to the existence of possible mental factors in any way influencing the situation. When he is in doubt, one of the psychiatric teaching staff is always available to assist him in the analysis of the case and when he feels that there does exist such a factor, the teacher checks over the correctness of his deductions and also participates in the group conference when the case is presented for discussion. The development of this innovation in general clinical teaching activity without splitting psychiatry off into an isolated position should give our future graduates a reasonable working knowledge of this important phase of medical practice. It may be mentioned that in the assignment of clinic patients not one goes primarily to the psychiatric clinic, but is brought there later by the student as part of the consideration of the patient's total needs. The same attention to the mental needs of the patient is stressed as part of periodic health examinations. With the continuance of such a teaching policy, our future graduates will be better equipped to offset the development of mental disease in many instances and certainly be able more promptly to recognize the cases in which psychiatric assistance may be needed.

Much of psychiatric literature of today is presented in terms weird and wonderful to behold, in language incomprehensible to the working rank and file of the medical profession, and frequently a bit hazy to some reasonably well versed psychiatrists themselves. Could we not make it a point, particularly in our county and state medical gatherings, so to present the everyday problem in psychiatry that the general practitioner might feel that he could easily participate in rather than shun its practice?

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PYLOROSPASM DUE TO ALLERGY*

SIMULATING INFANTILE PYLORIC STENOSIS

By RAY M. BALYEAT, M.D.,
and
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That food sensitization may be an etiologic factor in pylorospasm in infancy has been suggested for many years. Richet[1] suggested this possibility in 1919. In 1929, Cohen and Breitbart[2] reported two cases of infantile pyloric obstruction whose symptoms were relieved by the elimination of foods to which they were specifically sensitive. Recently Rowe[3] has reported a similar case.

The importance of considering food allergy as one of the possible causes of pylorospasm simulating infantile pyloric stenosis is illustrated by the following case:

CASE REPORT

J. H., a boy aged 3 years, was first seen by one of us (C. M. P.) at 3 weeks of age suffering from colicky pains and persistent vomiting. Careful observation for a week led him to believe the child was suffering from hypertrophic pyloric stenosis. A surgical consultant concurred in the diagnosis. At 4 weeks of age the abdominal cavity was explored. No evidence of pyloric stenosis or any other abnormality of the abdomen could be detected. After the operation the child continued to vomit and cry with colic as before, but retained a sufficient amount of food to sustain life and even gained weight slowly.

Most of the time he has suffered from constipation, but often would have loose bowel movements with a great deal of mucus. The abdominal symptoms interfered so seriously with his comfort and growth that the parents demanded that something be done. The one of us who first saw the child and the surgeon who operated upon him had an opportunity to observe him carefully over a period of 3 years, and finally concluded that either the original diagnosis of hypertrophic pyloric stenosis was correct and that in the exploratory operation the pathological condition had been overlooked, or adhesions had formed, which might have helped in causing the present symptoms. The abdomen was again opened. Some adhesions were found, but they were not causing obstruction. The pylorus and stomach were both normal. After the second operation his symptoms continued as before.

Three weeks after the second operation he was brought to one of us (R. M. B.) for study from the standpoint of food sensitization as a possible cause of the symptoms for which he had been twice operated upon. A careful history revealed the fact that besides the vomiting and colicky pains from which he had suffered since 3 weeks of age, he had to contend from time to time with eczema of a rather severe form, from which he was suffering at the time we first saw him.

Family History.—His mother had migraine and eczema; one maternal aunt had hay fever and asthma; the maternal grandmother had asthma; the maternal grandfather had eczema and migraine; and the maternal great-grandmother had eczema.

The child had suffered from practically no disease except the gastro-intestinal symptoms and the eczema.

At 14 months of age eggs were added to his diet, which caused violent attacks of vomiting. The parents had learned that foods which contained egg always increased his vomiting, so eggs had been left out of the diet. They thought that they had been removing all foods which contained egg, but we found that almost daily he had been taking it.

At the time of the first operation the child's diet consisted entirely of breast milk. The mother reported that during this time, on account of the child's doing poorly, she was advised to have plenty of eggs and milk in her diet. About a week after the first operation he was placed on lactic acid milk, and for the next 3 years his diet was added to from time to time, using practically anything that they could get him to take that did not cause much vomiting.

Testing for protein sensitivity gave the following positive reactions:

Oats	++	Tomato	++
Egg	++++	Orange	++
Cow's milk	++	Grapefruit	++
Irish potato	++		

We removed from his diet at once all of the foods found positive, with the result that his abdominal symptoms disappeared in 24 hours, and his eczema in one week. By clinical trial we added, one at a time, the following foods: grapefruit, orange, tomato, irish potato, oats, and then cow's milk, with the result that he apparently was able to tolerate all of these foods well except cow's milk. On account of his emaciated condition milk was not entirely excluded from the diet. Then egg was tried in very small amounts. It caused a return of his abdominal symptoms, even when the smallest quantity was used. A number of times he has suffered with severe colicky pains. In going over his problem with the mother and the nursemaid we found that in practically each instance he had obtained foods containing egg. During one attack which was severe epinephrine was given in 6 minim doses, with relief of symptoms.

SUMMARY

In this case abdominal symptoms appeared at 3 weeks of age, at which time the diet was that of mother's milk. The symptoms were so typical of hypertrophic pyloric stenosis that one of us (C. M. P.) and a surgeon of wide experience, feeling confident that the diagnosis was correct, advised operative treatment. About one week after the operation the child was put on lactic acid milk. Vomiting and colicky pains continued as before. Egg-containing foods were added at 14 months of age, causing severe ab-

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dominal symptoms. From the time he was 6 months old he suffered occasionally with eczema.

The surgeon, feeling that either a pathological condition present in the pylorus at the time of the first operation was overlooked, or that adhesions had formed, which might be causing obstruction, advised a second operation, which was done at 3 years of age, with the result that no disease could be found to account for the child's symptoms.

Allergic studies elicited a family tree saturated with allergy. Testing found a skin strongly positive to a number of foods, two of which were eggs and milk. Clinical testing proved that of the many foods to which he was skin sensitive egg was the only one that produced marked abdominal symptoms or eczema. Milk taken in large quantities produced both mild abdominal cramps and skin symptoms.

CONCLUSIONS

(1) The foods to which a child is specifically sensitive may appear in the mother's milk in sufficient quantity to cause violent abdominal symptoms.

(2) A child may clinically be extremely sensitive to two or more foods, developing a complete or practical tolerance to one and retaining a marked sensitization to the other.

(3) A patient may be skin sensitive to many foods, but clinically sensitive to only one.

(4) A diagnosis of hypertrophic pyloric stenosis is not justified in a child whose family tree is saturated with allergy or who suffers from some allergic manifestation himself, until food allergy as a possible cause of the stenotic symptoms has been ruled out. The pediatrician and surgeon should not forget food sensitization as a cause of polyorospasm which may simulate closely infantile pyloric stenosis.

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DISCUSSION (*Abstract*)

Dr. Carroll M. Pounders, Oklahoma City, Okla.—Whether the symptoms in this case were due entirely to mechanical causes, to allergy or to a combination of both is a difficult question to decide. As I look back upon it, the evidences favoring mechanical obstruction were:

(1) The onset was rather typical for that of pyloric stenosis and occurred at the usual age for this.

(2) The early symptoms were fairly characteristic. The baby began to vomit both water and milk and the vomiting soon became projectile in character. There was visible peristalsis.

(3) The second operation revealed intestinal adhesions that looked as if they would be certain to cause some trouble.

(4) Heretofore these cases have practically all been diagnosed as pyloric stenosis.

Evidence in favor of the symptoms' being due to an allergic condition are:

(1) The baby was from an allergic family.

(2) The operating surgeon, who was a very competent man, reported that the pylorus was small and hard. The stomach was distended. The small intestine was extremely spastic. There was a little free fluid in the abdomen and the entire intestinal tract was hyperemic.

This does not coincide very well with the usual textbook description of the pathology of the condition, which is as follows: "There is a simple hypertrophy of the circular muscle which is often two or three times thicker than normal. The tumor is generally about the size and shape of a dressed olive, pale, smooth and hard like cartilage. The intestine becomes narrow and shrunken from lack of use. There are never any inflammatory lesions. The lesion is congenital and it seems impossible that the degree of hypertrophy which is found at operation a few weeks after birth could have developed in so short a time" (Morse).

(3) Vomiting was not relieved by the operation. It started as soon as water and food were put into the stomach again and was very troublesome for the next few weeks. The postoperative course was very stormy and it looked for some time as if we would lose the child.

(4) While the child later began to have less trouble from the vomiting, he continued to have attacks of severe intestinal cramping and much discomfort. This was not relieved by a later operation for adhesions.

(5) On two occasions recently hypodermic injections of epinephrine have seemed temporarily to relieve him during attacks of severe cramping.

(6) He has been troubled with eczema.

Whether or not such a condition can be entirely allergic and, if so, whether or not this is a frequent occurrence, only time and further observation will tell. I feel that it is worth investigating, and I feel that cases of pyloric obstruction in babies from allergic families should be carefully studied. Fluoroscopic examinations or x-ray pictures after a barium or bismuth meal may be of assistance. Attempts to relieve the symptoms by injections of epinephrine are justified.

Dr. Roy E. de la Houssaye, New Orleans, La.—We have had a similar case which developed in a baby two weeks old. There was projectile vomiting. There were definite peristaltic waves and a pyloric tumor mass was palpated. The diagnosis of pyloric stenosis was made.

At operation the pylorus appeared to be perfectly normal.

Later it was observed that the slightest feeding of cow's milk in any form caused generalized hives. The first time the formula of cow's milk was used after the operation the baby became desperately ill, ran a high temperature, and broke out in hives. She was put on goat's milk and made an uneventful recovery.

When three or four months old she was desensitized to cow's milk and later was able to take it. The child is now six years old.

Dr. Milton Smith Lewis, Nashville, Tenn.—Allergy has been the cause of pyloric spasm simulating pyloric stenosis in my experience also, in a case which came to operation.

The child vomited when breast milk was administered and was not able to retain nourishment. Pyloric spasm was definitely seen. At operation no tumor was found, and there was no marked abnormality except a dilated stomach. Evaporated milk and dried milk were tried, with little or no improvement. Upon goat's milk the child began to show definite improvement in the course of seventy-two hours and has progressed well since.

This case was, no doubt, a case of pylorospasm simulating pyloric stenosis due to sensitiveness to the mother's milk. The father of the child gave a definite history of having bronchial asthma and was being treated before the baby was born.

Another baby had exactly similar symptoms, and again x-ray of the gastro-intestinal tract indicated congenital pyloric stenosis. The Rammstedt operation was performed on the twenty-fourth day under local anesthesia and a definite pyloric tumor found. No further vomiting occurred.

These two cases are reported because of their identical symptoms from birth and identical physical findings. X-ray diagnosis by an excellent roentgenologist in both cases was pyloric stenosis. However, the important thing is that the first case gave a history of allergy in the father and the second case gave no history of allergy.

It is important to keep in mind that allergy can be the etiological factor in pylorospasm simulating pyloric stenosis, especially if there is a history of allergy in the parents.

THE INFLUENCE OF RUY DIAZ DE ISLA UPON THE QUESTION OF THE AMERICAN ORIGIN OF SYPHILIS*

A FRIENDLY POLEMIC

By C. S. Butler, M.D.,**
and
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Few papers published during the past fifty years are of greater interest to medical historians and psychologists than the article on the "History of Syphilis" by Iwan Bloch, which constitutes the first chapter of the first volume of the estimable Oxford System of Syphilis edited by D'Arcy Power and J. Keogh Murphy.[1] To medical historians all of Bloch's writings are interesting because he has convinced many reputable physicians and syphilologists that syphilis actually originated in America. What device of writing or of logic could attract physicians to this hypothesis, impossible alike both from historical and epidemiological standpoints? It has been pointed out by one of us (C. S. B.[2]) that even if pre-Columbian American syphilis were proven, it would not affect the certainty of pre-Columbian European syphilis. If the proponents of each hypothesis should agree to forget all about the evidence from bones and not bring it into the argument at all, the American proponents are nevertheless defeated because their hypothesis can be proven untenable in a number of ways.

To come back to the devices by which Bloch persuades physicians to forget what ends the human intellect is intended to serve! These may be described as follows: his plausibility in discrediting the most valuable evidence of his opponents. He can talk himself out of the most dangerous situation, the charm of his diction and intense pride of opinion serving often to anesthetize his antagonists. It takes a high-powered salesman to convince intelligent physicians that forty-four men returning to Spain with Columbus in the spring of 1493 could give syphilis to all the peoples of three continents within the next few months. In modern slang, Bloch was a master of ballyhoo and we must admire his effectiveness in this instance. He apparently has no respect for any opinion or piece of evidence which is against him. "Our side" is always right, our opponents naturally always wrong. He does not hesitate to put the opinion of a layman or of a savage or of a savage through a layman into the balance against that of a scientist and "knock down" the goods to the savage provided the latter's material is right. Take the two terminal sentences of the second paragraph on page 4:

> "All available statements and facts point to the last decade of the Fifteenth Century, particularly the years 1493-1500, as the time when syphilis first appeared in the Old World. There is not a particle of evidence to show that the disease existed in Europe before that time."

Strong words these and not very flattering to such medical scientists as Jourdan, Ricord, Parrot, Haeser, Hirsch, Benedetti, Sudhoff, Saliceto, Capparoni, Fracastorius and hundreds of others.

To give other concrete examples of Bloch's technic, we instance first the investigation of Brodmann (page 5) who in 1819 reproduced a

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passage from a chapter of Records of Mainz, which showed that as early as 1472 the Mainzians were using the term "Mala Franzos" for the disease syphilis. There was no apparent reason for Brodmann's falsifying the records, but Bloch demolishes him with the following sentence:

"According to my investigations which have been confirmed by Professor Karl von Hegel this date, 1472, which has so long fascinated historians, was falsified by Brodmann," *etc.*

It is interesting to compare Brodmann's findings for Mainz with those of Capparoni for Italy. Capparoni has shown that long before Charles the Eighth ever made his unfortunate descent upon Naples, the surgeon, Alessandro Benedetti (1450-1512) knew the disease syphilis in Italy and called it "Morbo Gallico."[3]

Nowhere is Bloch's partisanship so naively disclosed as in the following sentence, which disposes of all skin diseases confusable with syphilis (page 7):

"This group of pseudovenereal and pseudosyphilitic diseases is exceptionally large, and even sixty years ago the clinical physician, Canstatt, realized that it furnished all the reputed cases of syphilis described by the older authors."

Forgetting the crass instance of begging the question which this affords, one would like to ask Bloch if this also accounts for all the leprosy treated in Europe's thousands of medieval lazarettos, and particularly for that type of leprosy which in those times was recognized as curable. We do not see much curable leprosy at present even with the much vaunted chaulmoogra-esters treatment. What has become of it?

Bloch's fanaticism shows at its best at the bottom of page 6, where he uses these words:

"Up to the time of Ricord, i.e., at the beginning of the second half of the Nineteenth Century, the three venereal affections, syphilis, venereal ulcer and gonorrhea, were not clearly differentiated, but were thought to be fundamentally the same, whereas we now know that syphilis in particular as a specific infectious disease with constitutional symptoms has to be sharply distinguished from the other venereal disorders which only locally manifest themselves."

He says here that though we could not even differentiate gonorrhea and syphilis from chancroid until 1858, that nevertheless and notwithstanding we must admit that syphilis did come from America. Some years after Bloch had committed this faux pas, Pusey[4] tried to "throw him a line" by inserting that before 1493 genital sores were not followed by constitutional disease. This, however, is not true, as the relation of genital sores to constitutional disease was known as early as 1276 by William Saliceto (1210-1277) and others,[5] though this was not printed until after the development of printing. It was printed, however, between 1470 and 1480. Not only so, but hard and soft sores were differentiated by Celsus with much greater precision than was done by any writer before the year 1858. Celsus, the Roman physician, who was in his prime 15 centuries before John Hunter had muddled our knowledge of venereal diseases, should have the credit for having differentiated the hard and soft venereal sores (A. Corn. Celsus, Lib. VI, XVIII, 2).

The prize piece of effrontery, however, is where Bloch quotes Las Casas (1474-1566), who quotes the Haitian savages to prove a point. Las Casas was a good man, a clerical and the first priest to be ordained in the New World (1522), notable because his solicitude for the Indians caused him to recommend to the Spanish sovereigns the substitution of African slaves for the Indian ones, thus forgetting that human slavery was the crime and not the race enslaved. Here begins African slavery for the New World!

Bloch quotes Las Casas in the following terms and it may be here said that all the self-certified history interpreters in the same huddle with Bloch have quoted this Alice-in-Wonderland prattle in order to offset the two-fisted evidence on the other side.

"I took the trouble on several occasions," says Las Casas, "to interrogate the Indians of this Island (Haiti) as to whether this disease was of great antiquity, and they answered "Yes," that it dated from a period long before the advent of the Christians, the origin of it being beyond the memory of any man, and nobody can disbelieve this."

Now let us look at the actual history of this little tete-a-tete. Oviedo Y Valdes (1478-1557), a layman, gives the identical material. He wrote his before Las Casas, however, publishing briefly in 1525. Las Casas, while believing Oviedo to be a monumental liar, was nevertheless not averse to accepting this little fancy of his as true. Both the reporters in this case were laymen, Oviedo a writer, Las Casas a priest. But both these laymen took their information from someone else, Las Casas actually from savages. This is a fine, convincing, scientific set-up, I must say. Yet Bloch does not hesitate to put this up against the opinion of one of the world's greatest physicians, Fracastorius himself, who stated with all the elegance of his poetic nature that this American idea was the buncombe.

It is probable that Oviedo first gave impetus to this "fairy tale" about the American origin,

but it was a welcome escape for all classes of society of all nationals. It is well known that the church in those days had a great deal to say about the interpretation of scientific facts and historical incidents. It was as much as a man's life was worth to get in bad with the Pope by some unguarded or unorthodox publication. We know that Alexander VI (1431-1502), Pope from 1492 to 1503, was a syphilitic and died probably of that disease. His physician, Peter Pinctor, in a volume called "De Morbo foedo et occulto," Rome, 1500, says this disease was known for years in Italy as the French disease, but differently in Valencia, which was Pinctor's native state (p. 22).[5]

Fracastorius (1483-1553), before publishing his poem, felt the pulse of ecclesiastical opinion by submitting the poem to Bembo (1470-1547), one of the lovers of the celebrated Lucretia Borgia (1480-1519), who was the illegitimate daughter of Pope Alexander VI. Indeed, he actually dedicated the book to Bembo, who was afterwards made cardinal (1539).[6] In 1501, Alexander VI instituted book censorship.

Bloch, who knew the literature of syphilis completely, slurs over many of the names of those who wrote concerning it from 1493 on and selects only those who favor his views. He then lights upon a physician whose views were known, but who was considered of so little importance that his name is not listed in any encyclopedia or dictionary of names at our disposal. This was the Spaniard Ruy Diaz de Isla. We were finally able to gain access to a photostat copy of this author's work (published in 1539) at the Huntington Library at San Marino, California. One of us (J. A. B.) translated it for its meaning only. After this was done we found that Girtanner (Abhandlung uber die venerischen Krankherten, 3V, Gottinger 1788-1789), had "blurbed" de Isla nearly one hundred years before Montejo y Robledo had "critically discussed" the vexed question of the American origin as related by Bloch in the opening paragraph of the Oxford chapter on the history of syphilis.[1] De Isla's "Tractado contra el mal Serpentino" of 1539 not only gives material current then, but apparently took much of it from Fracastorius (1530) and others who had published before him.

This particularly applies to the use of mercury in the treatment of syphilis, a knowledge too great to have been developed in his own lifetime even if he did record it as claimed by Bloch between 1510 and 1520. De Isla was not responsible for the American origin idea. This, according to Jourdan[5] (p. 7) was the product of the fertile brain of a German physician named Leonhard Schmauss, who launched it in a dissertation called "Lucubratinucula de Morbo Gallico, et cura ejus noviter reperta cum ligno indico, in 8 vo., 1518." He, Ulric Van Hutton and others, including Oviedo, took up the cry about the use of guaiac and its great value in the Island of Hispaniola. This was all mistaken and largely non-professional opinion. Guaiac never did have any beneficial effect upon syphilis either in the Island of Haiti or out of it.

But it is evident from our later reading that de Isla had been resurrected and laid to rest at least once before Bloch's hero, Montejo y Robledo, snatched him from the jaws of death in 1882. Jourdan laid him to rest (pp. 28-30) in 1823 in the following paragraphs:

"The next writer cited by Girtanner is Rodriguo Diaz de Isla, whom he represents as being at Barcelona at the time of the arrival of Columbus, and having, soon after, written a treatise on syphilis. This author informs us that not long after the return of the admiral the city was infected with a horrid pestilential disease, and such was the fright it inspired that to obtain its cessation public prayers were ordered, together with fastings, and other religious ceremonies.

"Of the life of Diaz de Isla we are totally ignorant, and his work originally written in Spanish (Tratado contra las bubas. In the Syllog. of Welsch, p. 31) is only known from a Latin translation, inserted in the collection of Welsch. We only learn that he practiced medicine at Seville. Whether he was at Barcelona, and frequently associated with Columbus, is very doubtful. He would not, probably, had it been true, have omitted to notice it. But there is no evidence in his writings to this effect. According to Welsch, his work was only written in 1555, sixty-two years after the first return of Columbus, from which we are warranted to conclude he could not have been an ocular witness. Besides, when Columbus left Seville for Barcelona, his suite was composed of a few Spaniards and six Americans. How can we, then, for a moment suppose that he, or those who accompanied him, could, in so short a time, have propagated so terrible a disease as that mentioned by Diaz? In fact, this plague appears to have existed only in his imagination, as no mention of it is made by Oviedo, who then resided at Barcelona. But if, from the silence of a man of so little weight, it be maintained that we cannot deduce anything favorable to our assertion, we are forced to regard that of Peter Martyr, then thirty-eight years of age, and director of the college instituted for the young nobility by the Queen Isabella, as presenting no just ground for this objection. His letters (Opus Epistolarum Alcala, 1530), in which he speaks of the arrival of Columbus, the wonderful things he brought, the Indians who accompanied him, and the sensation created by so many novelties, do not notice the pretended plague of Barcelona. Neither does he say a syllable about it in his history of America, the most ancient work we possess on the discovery of the New World (De orbe novo decades, in 4to. Alcala, 1500).

"The third authority cited by Girtanner is Ferdi-

nando Columbus, the son of the admiral, who wrote the life of his father from notes found among his papers (La Historia del Almirante don Christoval Colom. in Bareia, historiad, C. 72, C. 7, p. 63). He mentions that when Columbus returned to St. Domingo, for the third time, in 1498, he found that the colony had revolted and was reduced to 160 men, all affected with syphilis.

"It cannot, to us, be a matter of surprise that the disease was found at St. Domingo in 1498, nor can we for a moment think it necessary in the explanation of this fact to admit that it was endemic in that island. It is much more reasonable to suppose that syphilis, known in Europe for the last five years, was carried thither at the time of the second voyage of Columbus. In no other part of the work do we find any mention of the syphilis of America, or the plague of Barcelona: nor do we discover anything on the subject in the detail of the expedition of Columbus written by Madrigano, or in the works of Vespucius, Benzoni, Nigno and Anthony Gallo."

Before taking up briefly in closing the value of the evidence from pre-Columbian bones, we shall say a few words concerning certain collateral evidence against the American origin. Since first seeing in Bloch's article[1] a reproduction of Durer's woodcut called "The First Syphilitic," which was published at Nuremberg in 1496 by Theodore Ulsen, four items have interested us. These were, who was Ulsen, what was the meaning of the date 1484 in the zodiac shown in this famous picture, where is the picture now, and is it a genuine Durer? Dr. Kurt Von Manteuffel, Director of the Staatl. Gemaldegalerie at Dresden, was able to answer the first two questions from volume 1 of Albrecht Durer by Edward Flechsiz, 1928, G-Grote, Berlin. In the French of the author on page 309 is the following sentence:

"Theodore Ulsen, medecin et poete en meme temps, etait natif de la Frise. Il vint, en 1498, a Nuremberg et y vecut jusqu'en 1531 en qualite de medicin ordinaire de la ville. *La date de* 1484 *sur le Zodiaque doit indiquer l'annee dans laquelle parut pour la premiere fois le mal de Naples qui se declara a Nuremberg en* 1494." (Italics of the authors.)

Now the explanation given by the proponents of the American origin is that the syphilis-engendering conjunction of the planets Mars and Jupiter took place in 1484, but it took until 1496 for this to have its effect. All of which adds to the general merriment and to the ridiculousness of the position taken by Bloch and his followers!

The two last questions indicated above were dug up for us through the courtesy and thoroughness of an engineer friend, Mr. Erik W. Ehn, of Schweinfurt-am-Main, after many fruitless trips on our part to answer them. Here is part of his letter:

Berlin, September 26, 1930.—"I have located the woodcut you wanted me to look up. The copy I have seen is in the *Friederich Wilhelm Museum* in the department Koenigliches Kupferstick kabinete. The woodcut is very rare, but about twelve copies are known. In Vienna a somewhat different print is to be found, but the difference is mainly that a part of the picture at the lower end has been cut off and something else written thereon. . . . . The woodcut is about 28 x 40 cm. in size. It is very clear and well painted, apparently in water colors. . . . . I had no difficulty in locating the picture. I was given a big book containing all known woodcuts of Durer and on locating the picture the original was brought to me."

The following is a translation of the remarks in this book concerning this picture:

"Picture 92—The French Disease. (The Syphilitic). P. 198-1495 or 1496. D. S. 268. Was given out as a single printed page with a verse by the Nuremberg physician, Dr. Ulsenius, whose origin was the Friesian Islands, 1 August 1496 (Schr. Friesian Islands, 1926). The shields over the shoulders of the man who is covered with an eruption show the Nuremberg coat of arms, above the man a sphere with the Zodiac and below the sun. The first to mention the print was H. A. Cornill d'Orville (Naumanns Archiv., 1856, 2-10). Thauling said that it was not by Durer, also Weisbach (J. D. S. 72). Dornoffer believed it to be Durer (Klt Anz. 1905, p. 50). Dodgson said it was 'likely' to be a Durer, while Weirlgartner refused to believe it so. Stadler (p. 222) claimed it to be by the 'Bergmann-master,' i. e., by Durer, and later Haberditzl refused to believe it made by Durer. Haberditzl shows on page 174 a second variation (Vienna), by which about 2 cm. at the bottom of the picture have been cut off and a different legend added. The book from which this is taken is: 'Albrecht Durer: Samtliche Holzschnitte.' Herausgegeben von Willi Kierth mit einam Begleitwort von Campbell Dodgson Holbein Verlag, Munchen."

We are indebted for the following reference to Dr. Ing. R. L. Mehmke, of Stuttgart, Germany, an international authority upon the amount and type of knowledge of technical engineering possessed by the ancient Egyptians. Fequier, "Histoir de la civilisation Egyptienne," Paris, 1914, page 87, says: "On a pu constater sur les os des traces de deuse maladies, la tuberculose et la syphilis." Dr. Mehmke quotes the above author as making this statement for the prehistoric period of Ancient Egypt, which is from 3000 to 4000 B. C.

We are well aware that European and American bone experts would not put up with this statement for a moment. But neither would they put up with any other statement regarding pre- or post-Columbian bones which failed to agree with their opinions. In a comprehensive and erudite article on this subject, Dr. Herbert U. Williams[7] has recently summed up about all that is known concerning disease evidence from

bones of all ages, ancient, medieval, and modern. This brochure is an excellent syllabus of bone changes in disease. It will be evident, we believe, to most unbiased readers of his brochure that Dr. Williams has committed the same fatal error that shows on every page of Bloch's material. He points out the great difficulties involved. One must be certain of the luetic nature of the bone lesion and he must be certain that the particular bone is pre-Columbian. We believe no one doubts that there should be more post-Columbian European syphilitic bones than American because of the vastly greater population and especially after the great Fifteenth Century epidemic there should have been many European syphilitic skulls, the age of which was debatable. Not so, however, according to Dr. Williams, for on page 82 he says:

"In contrast with the small number of bones from the Eastern Hemisphere that are suspected of showing ancient syphilis, the amount of material in America is almost embarrassing."

Which reminds us of the young lady who, having strayed from the path of virtue and been delivered of a small baby, was being mildly chided by the dear old family physician who had delivered her. Quick as a flash she parried: "But oh, doctor, it was such a *little* one!"

Dr. Ales Hrdlicka is concededly one of the world's greatest anthropologists. In addition, he is a medical man who knows the bone changes of syphilis as well as any of us. We have heard him state in an address delivered at the Naval Medical School in Washington less than a year ago that always when the graves or tombs of American Indians were studied carefully and syphilis found, there was something present to show that the white man had been there, his glass beads, his fabric or his iron implements.

In view of the great difficulties involved in the diagnosis of pre-Columbian syphilis by means of the bones it is modestly put forward as a dependable means of settling the question of the presence of syphilis in the Old World previous to Columbus, that Egyptian mummies of ancient times be carefully studied for the presence of aortic aneurysm. It was pointed out by one of us (C. S. B.) that the Romans must necessarily have had syphilis because several of their surgeons and particularly Antyllus, a contemporary of Galen, developed a technic for the cure of aneurysm which held the field until John Hunter's operation was adopted about 1786.[8] There should be no difficulty in determining either the antiquity of the material or the presence of aneurysms provided the practice of mummification did not eviscerate the remains before applying the preservatives.

Those who doubt the antiquity of thoracic aneurysm should read the section from Greek Medicine by Arthur J. Brock, Appendix B, beginning on page 247 of that volume. This is a translation from Aetius of Amida on "Aneurysm." Aetius, Sixth Century A.D., treats his readers to a perfectly good description of aneurysm of the aorta.

RESUME

Material on the history of syphilis, particularly that part of the literature coming between the dates of 1490 and 1550, is reviewed, and a personal research on Durer's picture, "The First Syphilitic," is reported, evaluation of the importance of the date "1484" on this picture being emphasized.

The book of Ruy Diaz de Isla is critically analyzed and it is shown that this author's material was long since appraised as having little value in the discussion of the "American Origin."

CONCLUSIONS

The following are the conclusions which the article arrives at:

(1) One of Dr. Iwan Bloch's articles on the "History of Syphilis" is critically analyzed and the conclusion reached that its effectiveness is due to his skill in intellectual legerdemain.

(2) It is pointed out that even if pre-Columbian American syphilis were proven, it would not affect the certainty of pre-Columbian European syphilis.

(3) Some medieval peoples knew the connection between genital sores and constitutional disease. But they did not know that *Treponema pallidum* caused syphilis any more than that *Bacillus tuberculosis* caused phthisis. We do not conclude, however, that tuberculosis came from America simply because of this insufficiency of knowledge on the part of our forebears.

(4) It requires so many types of "expert" to determine the age and diagnosis of syphilitic osseous material that bones are practically useless in answering this question.

(5) It is suggested that the determination of aneurysm of the aorta in Egyptian mummies might serve to answer our question.

In the preparation of this article we are indebted to Captain R. C. Holcomb (MC), U. S. Navy, for many valuable suggestions.

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THE EFFECTS OF MILK INJECTIONS IN CHRONIC PELVIC INFLAMMATORY DISEASE*

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Since the introduction by Schmitt and Saxl in 1916 of milk as a non-specific protein treatment in infectious diseases, its use has become world wide and its results have been reported by many, both in this country and abroad.

Milk injections in the treatment of pelvic infections were first used in this country by Dr. Gellhorn,[1] of St. Louis, in 1922. He treated 10 cases of gonorrhea in females and reported 6 completely cured and 2 definitely improved. All had signs of a subacute or chronic pelvic peritonitis with thickened and painful tubes. His early impressions of non-specific protein therapy caused him to prefer milk as the most efficacious agent in pelvic disease.

In his opinion, the introduction into the body of a foreign protein brings about a stimulation of the cells of the body to greater physiological activity. This stimulating action is felt by all the cells, but especially by those that have been damaged by disease. The tubes and uterus and perhaps the bladder appear to be more responsive to this form of treatment.

Herrick[2] states that the injection of a foreign protein in the form of serum, killed bacteria, milk or other substances, "may incite the production of a certain amount of antibody somewhat specific in function."

"Physiologists have long since shown that cells of an abnormal character, so long as they are not exhausted or fatigued beyond recovery, are more susceptible to any kind of stimulus than the normal cells are, and as a result the defensive cells in this combat for life are whipped up to new activity as seen by a changed condition of the nucleus and acceleration of cellular metabolism. As a result of this, phagocytosis is increased. It is the reaction, therefore, not the agent causing it, that is immediately responsible for results. It may be quite possible that the body has a reserve of non-specific antibodies for emergencies."[3]

If the injection of foreign proteins stimulates the body to the production of antibodies in sufficient amounts a cure may be effected, but failing in that, a localization of the infection may result so that the infected area becomes amenable to surgery.

Clinically it has been shown that foreign protein injections improve the patient's resistance, bring about an absorption of exudates, hasten a resolution of lesions and cause an improvement in many conditions that resist any other form of treatment.

Peterson,[4] who published a most interesting book on this subject, lists a large number of proteins that have been used advantageously. Such agents as sterile milk, normal blood, killed bacteria, peptones, vaccines, tissue extracts, bacterial extracts and yeast have been used during the past ten years in pelvic infections, septic abortions, puerperal sepsis and other conditions. The results, from the literature, seem to be universally satisfactory. The majority of observers are of the opinion that pelvic infection responds more favorably to non-specific protein therapy, and that gonorrheal salpingitis, which forms the greater part of such infections, is especially influenced by a destruction of the gonococci, absorption of pus and a restoration of the tubes towards, if not altogether to, a normal condition.

Gellhorn[1] says:

"Practical experience has shown that foreign protein therapy gives a promise of cure largely in subacute and early chronic cases of salpingitis and pyosalpinx and is apt to fail in cases of very long standing."

Having been convinced of the value of this form of therapy in the acute cases of salpingitis, we deemed it advisable to try it out on the

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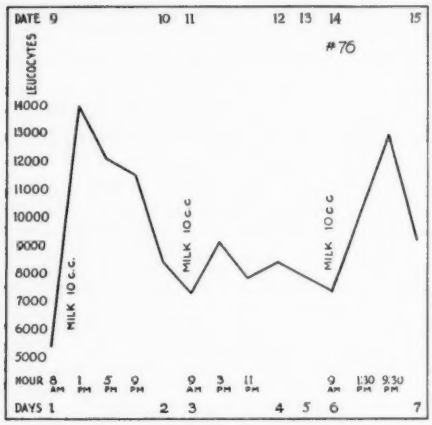
*Read in Section on Gynecology, Southern Medical Association, Twenty-Sixth Annual Meeting, Birmingham, Alabama, November 15-18, 1932.

*From the Department of Gynecology, Emory University School of Medicine.



Graph 1
Leucocyte count before and after injections of fresh milk.

chronic or ambulatory type. The foreign protein chosen was skimmed milk, boiled for twenty minutes and allowed to cool. The first dose is 5 c. c. injected intramuscularly and each subsequent dose is 10 c. c.

The patients are treated once a week. An examination is made before commencing treatment and repeated after each fifth dose. All findings are recorded. The graphs illustrate graphically the course of the leucocytes following the injection of ordinary sterile milk and the difference of the results obtained with a proprietary milk prepared for injection. I am indebted to Miss Mary Crews, of Emory University, for the tedious laboratory work done in this comparative study and for her kindness in allowing its appearance in this paper.

Miss Crews made a careful study of the blood picture in 40 cases, 20 of which received fresh milk and 20 prepared ampoules of aolan. She found that

"Consistently good results may be obtained from the intramuscular injection of sterile milk. A leucocytosis follows within twenty-four hours, and most often within four hours. No such uniform results may be claimed for the proprietary ampoules.

"Sufficient uniformity of results was not found to warrant claims for any specific bone marrow response following the injection of fresh or prepared milk."

The results in 9 cases which have been very closely followed will be summarized.

From 5 to 22 leucocyte and Schilling differential counts before and after the injections were made in each case. Fresh milk was administered to 5 patients in whom the diagnosis was: (1) chronic salpingitis and fibroid uterus with adhesions; (2) fibroid uterus and cystic lacerated cervix; (3) chronic bilateral salpingitis, fibroid uterus and cystic ovary; (4) chronic pelvic inflammatory disease, fibroid uterus, rectocele and cystocele, hypertensive heart disease and secondary anemia; and (5) chronic bilateral salpingitis, fibroid uterus, and *Trichomas vaginalis*. A rise in the leucocyte count was observed after practically every injection, the peak occurring in from 4 to 24 hours. Following one injection the increase amounted to 8,650 cells.

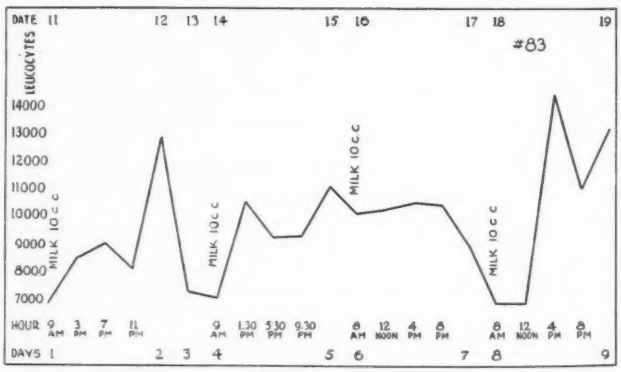
Prepared proprietary ampoules of sterile milk were similarly used in the following conditions: (6) chronic pelvic inflammatory disease with fibroid uterus; (7) chronic salpingitis; (8) bilateral salpingitis; and (9) bilateral salpingitis with cystic ovary. A rise of approximately 4,000 cells occurred after two injections. However, in the same patient at other times a fall of leucocytes was noted. The results were not constant or predictable, and the rise when noted was less than that following fresh milk injections.

In the two groups, one of which received fresh milk and the other prepared ampoules of milk, no constant or characteristic change in the Schilling differential count was noted.

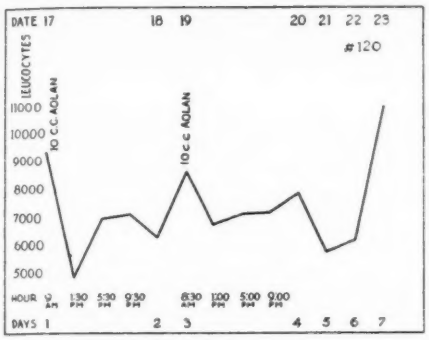
Graphs have been prepared showing typical leucocyte counts in 2 cases of each type.

The work was begun in 1927 in the colored clinic at Grady Hospital, Emory University Division. At that time about 70 per cent (estimated) of all gynecological operations done in Grady Hospital (colored) were for chronic pelvic inflammatory disease. This percentage has been noticeably reduced since the establishment of the milk clinic.

It is an interesting fact that these cases have no marked reaction (chill, fever, so forth) such as is experienced by the acute cases. There is, however, a cell reaction as shown by the in-



Graph 2
Leucocyte count before and after injections of fresh milk.



Graph 3
Leucocyte count before and after injections of a proprietary prepared milk.

crease in leucocytes following each injection and this observation, it would seem, disproves the claim made by many that unless you get a chill and fever following injection the procedure is of no value.

With the exception of about 15 local infections (abscesses), all dating from the same time and evidently due to a break of technic, no infections resulting from the injections have been brought to my attention during the past five years. There has been no evidence of anaphylaxis in a single case, although 18,270 injections have been made. Rarely a patient has shown evidence of an immediate and transitory reaction, probably due to nervousness or penetration of a blood vessel.

The beneficial effects are very satisfactory. Practically all the women state that the pain became less or disappeared entirely, the appetite improved and they were able to carry on their work.

Dysmenorrhea, scanty menstruation and menorrhagia have been relieved in several instances.

It was observed that some of the women failed to respond to the treatment until 15 or more injections were given.

Not infrequently it is necessary to resort to operation. Following is a brief description of a typical case:

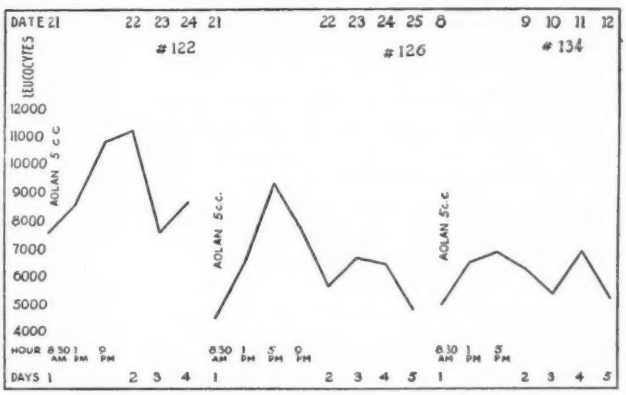
The patient had tender, tubo-ovarian masses with a fixed uterus. Five injections of milk caused her to feel better. Following ten injections the uterus was movable. There were tenderness and thickening in both fornices, but no masses were palpable. She was dismissed to return in 3 months for examination. She did not return until 12 months had elapsed, at which time the symptoms and findings were similar to those mentioned above. Experience has taught us that cases of this type require surgery. Following another series of injections the operation is done, although some patients feel so much better following the injections that they refuse operation.

Protein injections seem to have a hemostatic effect, as evidenced by the fact that there is less trouble in controlling bleeding areas when adhesions are released.

While I am not convinced that adhesions are absorbed by protein therapy, I am satisfied that they are softened and much more easily released and the raw surface is more satisfactorily peritonealized. Convalescence seems better in every way. About three years ago we began using the injections as a preoperative procedure in all gynecological cases. Since the adoption of that procedure our mortality has been markedly reduced and postoperative obstructions are relatively rare. I believe the milk injections are responsible in a great measure for this improvement.

In the clinic, in addition to milk injections, the women are instructed concerning hygienic conditions, douches and food, and where indicated, the cervix is cauterized.

Milk was originally used by Schmitt because of its availability. Gellhorn stated ten years ago that in his opinion no protein surpassed it. We have tried several preparations and are convinced that milk gives the most uniformly satisfactory results.



Graph 4
Leucocyte count before and after injections of a proprietary prepared milk. Three cases are illustrated on this graph.

To illustrate graphically the classification and disposition of clinic cases, a small number of charts were selected at random from the files of the past five years with the following results:

Year	Cases
1928	26
1929	46
1930	62
1931	35
1932	30
Total	199

These were classified as follows:

Diagnosis	Number		Per Cent
Chronic salpingitis	121	or	60.8
Fibroid with chronic salpingitis	17	or	8.5
Cystitis with chronic salpingitis	7	or	3.5
Acute and subacute salpingitis	9	or	4.5
Bartholin's abscess	7	or	3.5
Pelvic abscess	9	or	4.5
Fibroid with acute salpingitis	3	or	1.5
Acute gonorrhea with salpingitis	6	or	3.1
Acute vaginitis	7	or	3.5
Pregnancy with chronic salpingitis	1	or	.5
Endocervicitis	12	or	6.1

DISPOSITION OF CASES

Improved and dismissed	37	or	18.5
Improved, to return for observation	55	or	27.5
No improvement	7	or	3.5
Operation advised	23	or	11.5
Failed to continue treatment	77	or	38.6

SUMMARY

(1) The intramuscular injection of sterile milk is a valuable adjunct in the treatment of chronic pelvic inflammatory disease.

(2) Graphs are submitted showing that the injection of milk is followed by leucocytosis, usually within four hours. Fresh milk is more effective than the commercial preparation employed.

(3) Patients feel better, gain in weight and continue their routine work after the injections.

(4) Major operations occasionally are avoided.

(5) Preoperative injections of milk make operation somewhat less difficult and abbreviate the period of convalescence.

(6) In 18,270 injections given over a period of five years, there has been no evidence of untoward effect in any individual.

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478 Peachtree Street, N. E.

DISCUSSION (*Abstract*)

Dr. Gilbert F. Douglas, Birmingham, Ala.—Non-surgical treatment of pelvic inflammatory disease has permitted many patients to become perfectly well, and later on to bear children and continue to play a normal role in society, who would otherwise have been made invalids or neurotics. This, with other palliative treatments, has rehabilitated and saved thousands who, 15 to 20 years ago, would have been operated upon and hopelessly incapacitated. It seems easy to remove tubes, ovaries, so forth, and to presume that our whole task has been completed.

It has been proven that injections of foreign protein stimulate white cell production, hence increase the defensive forces of the body.

It is good to feel that there is a predilection for the tubes and uterus in this type of treatment, for these organs are most delicate in their make-up, and so are easily crippled.

Regardless of what the process is, if more white cells can be thrown into the pathological field to act as scavengers and to increase the body defenses without harm, it is to be desired.

However, these cases should be watched closely. The cells should not be taxed to the point of fatigue, for this reaction would be that of the tired horse to the whip, which exhausts all reserve energy.

This method of treatment is probably employed more commonly in infections of gonorrheal origin. If we find that it helps us in cases of septic abortion or puerperal sepsis, we shall be happy.

As it seems that the subacute and early chronic cases respond more readily and favorably, we should begin treatment of these cases early.

To be able to see a reduction in the operative mortality after the milk injections is quite gratifying, and I think the increase in the leucocytes and their stabilization before operation are great assets. Secondly this preoperative treatment and observation is beneficial in that it helps us to know our patients better.

The host of cases of chronic pelvic inflammatory disease should not be placed in the incurable class, which only operation will benefit; but the ray of hope should be held out for conservative or palliative treatment.

Dr. John F. Denton, Atlanta, Ga.—The injection of some form of non-specific protein in acute inflammatory diseases of the pelvis, particularly those of gonorrheal origin, is a recognized form of treatment; but it is not used frequently in chronic cases.

Dr. Greene's and my services are in the Emory University Division of Grady Hospital. I see the patients only in the ward after they have had this treatment in the out-patient department. I believe our low mortality rate in those coming to operation is due in part to the preliminary treatment with milk injections. My experience with this treatment in my private patients has been as satisfactory.

SYMPOSIUM ON MALARIA

THE PART PLAYED BY A COUNTY HEALTH DEPARTMENT IN THE ULTIMATE CONTROL OF RURAL MALARIA*

By E. L. BISHOP, M.D.,**
Nashville, Tenn.

I had hoped to set a new precedent and spare you the boredom of a Chairman's Address, but the Secretary informed me that such a precedent would be "undesirable."

Moreover, he assigned the subject and gave instructions as to how it should be developed. Since the principal function of any chairman is to follow the instructions of the secretary as best he may, you will visit upon him such consequences as he may deserve.

It was suggested that I try to discuss malaria as a county health problem from the viewpoint of the local health department and with special reference to the possibilities and responsibilities of the local department in the attainment not only of the smaller and immediate objectives, but in the accomplishment of ultimate objectives as well.

Almost, it would seem, such discussion is superfluous, for malaria is a communicable disease requiring detailed community activities for its control, and the rendition of service in the accomplishment of such activity for the control of transmissible diseases is a prime function of any local health department. Perhaps, however, the very complexities of malariology and the inherent difficulties of applying effective control procedures have served to discourage some of our rural health organizations when already we are faced by overwhelming tasks and utterly inadequate budgets. If so, we are making excuses and not giving reasons.

It seems to me we may accept as axiomatic the principle that the control of malaria is the direct and immediate responsibility of that element of government most intimately in contact with the community. Certainly it is the principle we follow not only in control of other communicable diseases, but in most of the other functions of government. Granting the truth of the principle, it is immediately apparent that local health departments, whether urban or rural, constitute the first lines of defense and that the service of other agencies must be rendered through and with the local organizations.

Bringing the discussion of principles to a more limited application, let us review rural malaria control in relation to rural health organization and activity and, in addition, the supplementary role which other elements of health organization must play. Where it exists in the southern United States, malaria is generally endemic in prevalence, but it reaches epidemic proportions only under some unusual combination of circumstances that usually are readily amenable to correction. While in most states malaria prevalence is limited to a relatively small area, in the aggregate the disease is second to few in its public health importance through the South. Its chronic nature, the fact that it is an endemic disease with high prevalence and complex epidemiology, the further fact that the application of control measures varies with the area concerned, make it obvious that the control of the disease involves not only a well conceived and detailed study of the local problems in relation to general principles, but also the projection of any control activities over a period of years and perhaps indefinitely. In other words, the control of this disease is not accomplished by sporadic efforts but by long, tedious, unremitting and intelligent application of effort. It is, therefore, perfectly apparent that a suitable organization for the administration of public health activity is the first prerequisite to the establishment of a malaria control program.

Assuming that such an organization exists, its first concern should be the definition of the malaria problem and its public health significance. Perhaps the most reliable index of prevalence, particularly within the economic reach of the average rural health department, is the blood index of school children. Spleen surveys are important adjuncts and additional information may be gained from practicing physicians, morbidity and mortality reports and community surveys. All of this initial phase of the work can readily be carried out through facilities of the local health department with the laboratory service of the central organization becoming responsible for the examination of smears.

When it is found that a problem exists and that it is one of public health significance, there still remains the necessity for the collection of much additional detailed information of epidemiological importance in order that a community diagnosis may be made and a feasible plan of control developed. Such items as the type and availability of medical service, laboratory facilities for prompt and accurate diagnosis, the location, duration and extent of mosquito breeding, the characteristics of breeding habits, the extent and location of actual and potential breeding foci, the stability, industry and general make-up of the population, and housing and other social and economic conditions, become matters of acute interest to the health department. In other words, there are three broad, though by no means exclusive, classes of information that will be of interest, namely: (1) medical, (2) social, and (3) engineering, but they vary so widely in different areas in their relative importance as to make each community a problem in itself for the development of malaria control.

During this study phase and the collection of infor-

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**State Commissioner of Health.

mation, the local health department must of necessity lean heavily on the expert technical and consultant personnel of the state health organization. Supplementary facilities obviously become necessary, but in the supplying of such facilities the integrity of function of the local health department should be preserved by the placement of the administrative direction of such personnel as may be detailed to the area by the state organization under the local health officer. With the acquisition of sufficient knowledge of local characteristics in the distribution of malaria, it follows that the formulation of a program of control activity is the next step. In this, too, supplementary service from the central health organization is essential and the local health department, unless it is unusual in the extent and character of its personnel, must lean heavily on such service, for unless both the study and projection of the program are developed with the most scrupulous care and attention to detail in the soundness of scientific procedure, the whole of the control activity which is to be established may have little or no practical value. In no two communities, perhaps, can precisely the same elements of control be combined into a local program and rarely, if ever, will a single measure be found sufficient.

Usually, especially in rural malaria work, the program rather naturally divides itself into immediate and ultimate objectives. For example, immediate objectives may be the screening of homes, the elimination or control of certain breeding places and similar activities, while the ultimate objectives may be major drainage operations and major improvements in housing and social organization. In both fields of service, however, the local health department retains the basic responsibility, but must use the service of the state and its consultant staff for the solution of its problems as they arise.

Finally, during the application of the control program that has been agreed upon, there is need for continuing analysis and appraisal of results and, here, too, while the basic responsibility rests with the local health department, supplementary service must usually be available from a coordinating agency such as the state health department.

The foregoing more or less detailed discussion of the steps in the formulation of its malaria control program by a rural health organization has been developed with the single point in mind of illustrating the fundamental fact that precisely the same relationship, the same responsibilities and the same interplay of service and activity exist between the state and local health organizations with reference to control of malaria as is the case in any other communicable disease. In brief, the first responsibility directly rests upon the local health department just as it does for the control of tuberculosis or syphilis. The local health department must assume this responsibility and in the formulation of a malaria control program for a state the state health department will be well advised to encourage the establishment of full-time local health departments throughout the area where control procedures are essential. Without such organization as a foundation, the program will fail beyond any question, but even with reasonably adequate local health service, there will remain the need for the same partnership between the state and local agencies as exists in regard to other problems in communicable disease control. Here, as in any other field of activity, the state organization must provide expert technical and consultant service both in the definition of the local problem and in the application of specific control measures; it must supplement local resources as regards the application of measures which cannot be provided by the individual community; it must engage in that research and investigation essential to the development and execution of a program statewide in its application.

All that has been said can be summed up in a paragraph about as follows: the development and administration of a control program for malaria does not differ in principle from that for other communicable diseases. It is approached through a definition of the problem in as specific terms as possible and the application of measures designed to meet the specific requirements. The place of local health organizations in the control of communicable diseases is well established, and such organizations constitute the foundation upon which a public health program must rest. To be effective, therefore, any program of malaria control must be made a part of the general program of the local health department with such additional facilities and aid as may be necessary rendered through the state health organization and not set up as independent services.

RECENT ADVANCES IN THE EPIDEMIOLOGY OF MALARIA*

By HENRY E. MELENEY, M.D.,
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and
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Jackson, Miss.

Your Subcommittee on Epidemiology has thought that it could best serve its function for the present year in two ways: first, by presenting a statement of the malaria mortality in the southern United States for the year 1931, and, second, by reviewing certain important advances which have been made during the last few years in the study of factors related to the epidemiology of malaria.

The mortality report will be made by Dr. E. C.

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*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Sixth Annual Meeting, Birmingham, Alabama, November 15-18, 1932.

*Report of the Subcommittee on Epidemiology of the National Malaria Committee.

Faust and represents a continuation of his study presented to the National Malaria Committee a year ago showing the mortality for 1930.

In reporting advances made in the study of the epidemiology of malaria, we have thought it best to limit our review to work done outside of the continental United States, since you are already familiar with what is being done in this country and since the American aspects of the subject will be largely presented at the present meeting. We should like, however, to call attention, as a matter of record, to the studies of Boyd and Stratman-Thomas at Tallahassee and of Bruce Mayne at Columbia, South Carolina, on induced malaria produced by bites of infected mosquitoes; to the studies on *Anopheles maculipennis* by Freeborn[1] in California; and to the studies which are being made by the Bureau of Malaria Investigation of the United States Public Health Service and a number of state and local health officers of the southern United States. All of these studies have an important bearing on the epidemiology of malaria in the United States as well as on its control.

A report of this kind can necessarily mention only a part of the work which is being done in foreign countries. It is based mainly upon information gathered through reprints and personal communications from leading malariologists in different parts of the world and from an incomplete perusal of articles appearing in current journals. The Subcommittee wishes to acknowledge its appreciation for the cooperation of the workers who have contributed to this review and at the same time to apologize for the necessary omission of other work which is probably of considerable importance. The review will be taken up by countries in order to attempt to form a picture of the methods and accomplishments in very large geographical units.

Beginning with South America, we wish to call attention to the many studies which have been carried on upon Anopheles mosquitoes by N. C. Davis, H. H. W. Kumm, R. C. Shannon and R. B. Hill. Many of these studies have been directed especially toward the incrimination of certain species of Anopheles as vectors of malaria. The most interesting and important of these studies has been the discovery of the presence of *Anopheles gambiae* (*costalis*) in Brazil by Shannon.[2] The mosquito was discovered in Natal on the coast of northern Brazil in 1930 and is supposed to have been carried to the Brazilian coast by one of the fast French mail steamers which makes the trip from tropical West Africa in four days. The fact that this species is probably the most important malaria vector in tropical West Africa makes its appearance in South America a matter of considerable concern. It was discovered, in fact, in connection with a severe outbreak of malaria in the City of Natal and seemed to have been responsible for the epidemic. One of the peculiarities of this mosquito is that it is particular in the selection of breeding places, being found mostly in small pools, often without vegetation, and apparently requiring fresh water, which is usually supplied by frequent rainfall. It prefers water exposed to the sun, but is sometimes found in shaded pools. Its presence is often increased by artificial conditions created by man and animals, such as borrow pits, drains, open wells, and hoof prints. Nelson was able to find the mosquito only in the City of Natal despite a rather extensive search for it in other neighboring regions along the coast and inland. Larvae were found in small, shallow collections of seepage and surface springs usually exposed to the sun and free from vegetation and predatory enemies. Nelson concludes that because of the prolonged dry season in this region, *Anopheles gambiae* will probably remain highly localized unless it adapts itself to local conditions or is carried to other regions in the New World more favorable to its breeding. This is a striking example of the danger of rapid travel in modern times in creating new malaria problems.

In Porto Rico the work of W. C. Earle[3] and others in incriminating *Anopheles albimanus* as the important malaria vector and in demonstrating the close relationship between the cultivation of sugar cane and the occurrence of malaria has already been reported to your Committee. The studies of the epidemiology of malaria in Haiti by S. S. Cook,[4] of the United States Navy, have also been reported before this Committee.

In Europe, a most important and interesting development is the study of the possibility of the existence of more than one biological race of *Anopheles maculipennis* and its relation to the problem of malaria distribution and the occurrence of anophelism without malaria. This study has been carried on independently for a number of years by several groups of workers. For a time it was based mainly upon theory but, with an intensive study of all stages of the life cycle, differential features are being found which seem to be related to the problem of malaria transmission.

Hackett and Missiroli, starting with the classification on the basis of eggs by Falleroni in 1926, have made more definite the distinction between Falleroni's two races, *labranchiae* and *messeae*, by placing the differences in the eggs on a more definite basis. Using these differences, they have studied, in cooperation with Martini of Hamburg,[5] the distribution of mosquitoes laying the two types of eggs and the relation of these mosquitoes to the occurrence of malaria. La Face[6] has carried the study farther into the larval and adult stages, where suggestive differences are also found.

Meanwhile, de Buck, Schoute and Swellengrebel,[7] in Holland, starting with the morphological observations by van Thiel in 1926 on racial differences in size, have independently demonstrated differences between the *maculipennis* found in malarious regions of that country and the one found in non-malarious regions. These differences are based upon the length of the wing, sexual habits in confinement, the fate of blood in the stomach during hibernation, certain characteristics of the egg and larva, and preferences in type of water for breeding.

The two studies seem to be converging toward a common point. We have attempted to correlate them as follows: the race *labranchiae*, according to Hackett,

Martini and Missiroli,[5] lays a dappled gray egg with small floats. It prefers brackish water for breeding, occurs in regions where malaria is actually or potentially present, appears to be relatively more prevalent than the other race in human dwellings, and does not go into complete hibernation. It seems to have definite affinities with *Anopheles elutus,* an important malaria vector in Palestine. La Face[6] has shown that the larva of this race has a true palmate structure on the second abdominal segment and that in the adult male the claspette is conical and has one or two sharp hairs on its ventral lobe. This race seems to be related to the short-winged race of de Buck, Schoute and Swellengrebel,[7] which lays an egg having a small float in which there is no network in the intercostal film, which is more domestic, which breeds better in captivity and without swarming, which digests human blood better in winter and does not hibernate, and which has the advantage when breeding with the other race in brackish water. It is also associated with the malarious areas in Holland. The second race, *messeae,* according to Hackett, Martini and Missiroli,[5] lays an egg irregularly pigmented in bars with relatively large floats. It predominates in fresh inland waters in Italy and Germany and in non-malarious zones, frequents stables more than dwellings and goes into complete hibernation in winter. La Face[6] has found that this race in the larval stage has only a branched hair on the second abdominal segment instead of the palmate structure and that in the adult male the claspette is more or less quadrilateral and has a blunt external hair on the ventral lobe. This race seems to correspond to the long-winged race of de Buck, Schoute and Swellengrebel,[7] which lays an egg having a large float with a network in the intercostal film, does not breed in captivity without swarming, does not digest human blood well during the winter and is at a disadvantage when breeding with the other race in brackish water. It predominates in non-malarious areas. Martini[8] and others still feel that caution must be used in assuming that the occurrence of malaria and anophelism without malaria in Europe is due entirely to the existence of distinct races of this mosquito, and that other factors may be important in the solution of this problem. It is evident, however, that the studies now in progress are directed along the proper lines and that they are furnishing evidence which may be of great value in the study of difficult problems elsewhere.

Hackett and Missiroli[9] have also made a valuable study of housing as a factor in malaria. A review by Clayton Lane[10] in 1931 indicated that there was still considerable difference of opinion as to the importance of house structure, lighting and cleanliness in attracting mosquitoes to their food supply. Hackett and Missiroli conclude that these factors are not important, that mosquitoes return only by chance to the place where they have previously fed, and that food preferences are the most important factors determining the place of visitation of mosquitoes.

In Italy, the important studies of malaria epidemiology and control in selected areas are being continued. Unpublished information, kindly furnished us by Dr. Hackett, brings out the following important observations. In estivo-autumnal malaria in Italy the pre-epidemic season (May and June) showed a conspicuous percentage of gametocyte carriers in the younger age groups, but none over 12 years of age. On the other hand, the influence of age in the contraction of estivo-autumnal malaria is not so important as in benign tertian malaria. Although children are more receptive than adults to *P. falciparum* infection, this parasite still attacks a large percentage of older individuals. In benign tertian malaria, on the other hand, the disease is prevalent only in early infancy, becoming relatively scarce after 12 years of age; but the peak of the disease occurs earlier in the year because of the large number of spring relapses in children, making gametocytes available in large numbers to the few anophelines which appear early in the year. Very few relapses of tertian malaria in adults are reported and evidence is found that malaria appearing in the spring in Italy is due to a prolonged incubation period of infections acquired in the previous year without clinical manifestations. The Italians also found that treatment with quinine for at least 60 days in the previous year did not lessen the tendency of benign tertian to relapse in March after an interval of 24 to 30 weeks. They conclude that tertian malaria prevails in June and July owing to the large number of gametocyte carriers in the pre-epidemic period, and that estivo-autumnal malaria prevails in July and August because of a greater receptivity of older age groups of the population. They also believe that the proper time for measuring endemic malaria in Italy is the period January to March in which the level of endemic malaria will hardly show any effect of intensive treatment during the previous fall.

We have obtained the following information from Dr. W. S. Leathers concerning malaria studies now being carried on in other countries in Continental Europe.

In Corsica the French, under the direction of Professor Brumpt, are making intensive studies along lines similar to those in Italy.

In Spain, studies on the Central Plateau, under the direction of R. B. Hill, show that a moderate amount of non-malignant malaria exists. The flight range of *Anopheles maculipennis* about the malaria station at Campolugar has been found to be more than four kilometers, or two and a half miles. Directions of flight are being studied by catching mosquitoes on sticky fly paper. Mention should also be made of the government institute of malaria at Navalmoral, where important epidemiological studies are being made.

In Hungary, a survey of malaria has been made by the Professor Parasitology of the School of Public Health at Budapest. A large amount of non-malignant malaria has been found irregularly distributed in the southeastern part of the country.

In Bulgaria, intensive malaria studies and control measures are being carried on under the direction of R. K. Collins. From a malaria station in Petritch work is

being carried on in a large surrounding area, including eleven towns, with a similar number of towns acting as controls. In the region of Plovdiv, rice fields have been found to be a prolific source of *maculipennis* breeding and a plan of alternately flooding the fields for three days and draining them for eight has been suggested for their control. Epidemiological studies have shown that Paris green dusting, filling and drainage must all be used as control measures.

In Albania, Hackett is making epidemiological studies which indicate that the malaria problem is largely associated with the cultivation of rice.

In Greece, M. C. Balfour is in charge of malaria investigations in cooperation with the government, and Dr. M. A. Barber has a special malaria station at Cavalla in northern Greece.

In England, the principal studies have been conducted in connection with induced malaria. S. P. James, Nicol and Shute[11] have made a study of infection with *Plasmodium falciparum* and have brought out important differences between the course of that infection and that of benign tertian malaria. These workers found no evidence of prolonged latent infection such as sometimes occurs with *vivax*. The incubation period varied from 6 to 17 days. They found that recrudescences occurred sometimes after a longer period than in benign tertian malaria, and that these merged into the periods of the so-called relapse and recurrence of benign tertian infection. In their small series of seven mosquito bitten cases, none suffered from a typical relapse or recurrence. They found that their cases infected by direct blood inoculation and by bites of infected mosquitoes behaved the same way in regard to recrudescences after the primary attack had been stopped by quinine. This is also in contrast to benign tertian malaria where blood infected cases were much less likely to relapse than mosquito infected cases. They found that quinine treatment of the primary attack brought about a permanent cure in less than 20 per cent of the cases of *falciparum* infection, whereas 50 per cent of the benign tertian cases were cured. About 20 per cent of the patients continued to harbor parasites for a longer or shorter period after an apparently complete clinical recovery. They confirmed the impression gained from clinical observations in naturally acquired *falciparum* infection that it is primarily an acute disease in which the primary attack is the only one in which there is grave risk of pernicious symptoms (except for blackwater fever).

Important studies in Africa have been made by Swellengrebel and his co-workers in South Africa,[12 13] by Barber and his co-workers in Nigeria and Liberia,[14 15] and by Gordon and Davey in Sierra Leone.[16] In South Africa the studies have brought out the importance of distinction between farm malaria and estate malaria. The farm problem concerns mainly the non-immune white population living amongst a relatively immune native population in an endemic area, whereas the estate malaria concerns mainly the native labor force which is often recruited from other non-malarious regions. Farm malaria scares away new white settlers, whereas estate malaria scares away fresh capital. These studies have also emphasized the difference between endemic areas and epidemic areas, which are distinguished by their climatic conditions, by the relative immunity of the inhabitants, and by the mosquito vectors. *Anopheles gambiae* (*costalis*), which is dependent almost entirely on local rains for its breeding places, is mainly responsible for the occurrence of epidemics in wet years and is always largely responsible for endemic malaria in regions with frequent rainfall. The other important vector, *Anopheles funestus*, is not dependent upon local rains for its breeding because it is a stream breeder. It is important in some regions in the maintenance of endemic malaria, but in other regions is not found in houses and is not apparently a source of infection. Swellengrebel[12] believes that the chief source of infection of anopheles for the white population in an endemic area is the native population and that the chief place of infection for the mosquitoes is within native huts rather than in the open. He believes that the equilibrium established by the white population is an unstable one, dependent upon the adjustment of Europeans to local conditions, and that there will always be great danger of epidemics from the importation of non-immune laborers into endemic areas. The decision as to whether a region is suitable for economic development must be dependent upon the results of a careful study of malaria in the native population.

In studies made in the Transvaal and in Zululand, Swellengrebel and his co-workers[13] have again found *Anopheles gambiae* and *Anopheles funestus* to be the principal vectors, and they believe that the high rate of infection of these mosquitoes is particularly due to the absence of stables to attract mosquitoes away from man. The native black population shows a considerable racial resistance to malaria in early childhood, notwithstanding heavy infection. It shows an acquired immunity later on by reduction of the parasite rate and by a high spleen rate and in adults an additional acquired tolerance with a lower spleen rate and still lower parasite rate. They believe that both the white and the Indian races are less able to shake off the aftereffects of malaria (enlarged spleens) than the native race, even when the latter has not become immunized by constant or repeated infection.

The studies of Barber and his co-workers in tropical West Africa have been equally valuable. In southern Nigeria[14] they have found that nearly all of the native population becomes infected with malaria during infancy and that the children suffer far more with the disease than do adults. *Anopheles gambiae* (*costalis*) is the chief vector in the vicinity of Lagos, whereas *Anopheles funestus* also becomes important in the inland hills. Three other species may also be important in southern Nigeria. The danger of infection is great in all months of the year, but especially in August and September. They found that a very low adult density of *Anopheles gambiae* is adequate to keep up a high malaria rate because of the high index of mosquito infection. In Liberia[15] a study has produced somewhat similar observations.

An interesting study has been made by R. M. Gordon and T. H. Davey[16] in Freetown, Sierra Leone, of the rapid increase of quartan malaria. Since 1925, this infection has spread from a small section of the city over the entire community. The increase in quartan infection seems to be at the expense of estivo-autumnal malaria, since no general increase in malaria has occurred. In the last survey, 68 per cent of the positive specimens showed *P. malariae*. These men were unable to infect either of the two common vectors of tertian and estivo-autumnal malaria in the region, namely, *Anopheles gambiae* (*costalis*) and *Anopheles funestus*. They believe, however, that if *P. malariae* is transmitted by an anopheline mosquito in Freetown, *A. gambiae* is the sole or chief vector.

Kligler and his co-workers in Palestine have continued their malaria studies, particularly with reference to the movements of Anopheles mosquitoes at various seasons of the year. They have studied the behavior of *Anopheles elutus* and of *Anopheles supertictus*. Kligler[17] concludes that, although different species behave differently during the active breeding season, the range of dispersion is far greater during the prehibernating and hibernating period than during the active breeding season. He finds that infected mosquitoes behave like non-infected ones. He believes that in Palestine zoophylic strains or races are the exception rather than the rule, and that under conditions prevailing in subtropical and tropical countries, the shelter and food preference of the anopheline vectors are regulated by temperature, humidity, light, wind and available food supply.

In India, it should be noted with regret that Colonel S. R. Christophers has retired from the directorship of the Central Malaria Bureau, but the work will undoubtedly continue with equal efficiency under the directorship of Lieutenant-Colonel J. A. Sinton. Many studies have been made within the last few years on the epidemiology of malaria in India, attempting to produce a thorough understanding of the problem before concerted control measures are instituted. Noteworthy are the studies in the state of Sind, in northwest India, by Covell and Baily, the surveys by G. Macdonald and his co-workers in the Punjab, in Bikaner State, and in Assam, the studies by Covell in the Patiala State, the Punjab and in Calcutta, and the surveys by Sinton in Kathiawar, north of Bombay. These studies are all published in the Records of the Malaria Survey of India. The study in Sind was started by McCombie Young[18] in 1927 for the purpose of discovering the probable effect on malaria of the Sukkur barrage scheme which contemplates the prevention of extensive flooding of the territory adjacent to the lower reaches of the Indus River. The studies of Covell and Baily[19] indicate that the principal or sole vector of malaria in Sind is *Anopheles culicifacies*, which breeds in subsiding flood water drained off from rice fields and in water leaking from canals into borrow pits. Malaria is most highly endemic in regions where flooding is greatest, and epidemics depend upon the occurrence of excessive floods and come at a time when the floods are receding. They believe the barrage scheme will decrease epidemic malaria by decreasing extensive floods, but that endemic conditions may be made worse if the level of the ground water is materially raised.

Of special interest is the study by Macdonald[20] of the mechanism of malaria infection in children and the significance of various degrees of splenic enlargement. Combining his observations in Sierra Leone, in West Africa, with those in Assam, he concludes, first, that only 60 per cent of infections are discovered by our present method of thick-drop blood examination; second, that the parasite rate among those with enlarged spleens is always about 60 per cent in most endemic areas; and third, that a true infection rate can be calculated from the actual parasite rate by multiplying it by a factor based on the parasite rate among those with enlarged spleens. He believes that only some 50 per cent of infections are of sufficient severity to produce enlargement of the spleen. As a result of his study in Assam he concludes that the parasite rate reaches its height in heavily endemic areas in the first two years of life, after which it decreases, and that the spleen rate reaches its height at from three to six years and thereafter declines. He finds that a large spleen is generally associated with a moderate parasite infection, whereas small spleens are associated with either a very small or very high parasite count.

In a later paper Macdonald[21] presents a theory of the cause of the various degrees of splenic enlargement. He believes that the initial attack of malaria causes a relatively slight enlargement of the spleen, possibly due to temporary engorgement only. When an individual has suffered for two or more years from splenic enlargement, a definite hypertrophy takes place, although the size of the spleen remains unaltered. A recurrence or a relapse in an individual with a spleen of this type results in further enlargement. Very large spleens are due to frequent reinfection in an individual who has for some years suffered from splenic enlargement, but in whom immunity is not well developed. Very small spleens are due to a light attack of malaria and the mildness of the attack is very frequently due to a partial immunity. An excessive spleen rate of this type indicates that the amount of malaria infection is static and that immunity is well developed.

The malaria studies in the Philippine Islands during the past few years have been mainly devoted to a clarification of the previously confused Anopheles groups by Baisis and by W. V. King, to a study of the habits of different species, and to malaria surveys by P. F. Russell and R. L. Holt. Russell[22] reports that malaria has been found to be a problem only at the junction of the plains and plateaus with the foothills, and is due to the concentration of breeding of the *funestus-minimus* subgroup of Anopheles in the running streams in these localities. In addition to this work we should call attention to the study of the experimental epidemiology of avian malaria by P. F. Russell,[23] in which an attempt is being made to reproduce in bird colonies conditions existing in human popula-

tions. These experiments still seem to be in their initial stage.

In China, it is encouraging to note that a beginning is being made in the intensive study of the malaria problem through the encouragement of the League of Nations and by the establishment of a Division of Malariology in the Central Health Administration at Nanking. Mosquito studies by trained Chinese medical entomologists also indicate that the malaria problem in China may be more vigorously attacked in the near future.

The Subcommittee realizes that this is a very inadequate presentation of an immense subject, but the material presented indicates that a great amount of intelligent effort is being expended throughout the world in a better understanding of the epidemiology of malaria.

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SOURCES OF REMEDIES FOR MALARIA*

By W. T. DAWSON, M.D.,
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As is well known the principal remedies for malaria are cinchona alkaloids, and of these quinine is of paramount importance. The latest government bulletin on the production and marketing of quinine appears to be Trade Information Bulletin No. 273, published in October, 1924, by the Bureau of Foreign and Domestic Commerce of the Department of Commerce. This bulletin is now out of print, but a copy was kindly made available for inspection by C. C. Concannon, Chief of the Chemical Division of that Bureau. The report indicates a substantial Dutch-controlled monopoly in the cinchona industry, but states that it is "not clear that the control of the Dutch monopoly has so far been in any way harmful to the general interest." Dr. Concannon states that the Kina Bureau, Amsterdam, controls the production and distribution, sales, prices, and so forth, of an estimated 97 per cent of the world's supply of cinchona bark.

A bulletin, "Quinine in South America", published by the Pan-American Union, Washington, D. C., is of interest.

Statistics given by Dr. Concannon as to South American export of bark in 1930 show possible totals of:

Bolivia	90	tons (metric)
Colombia	1.5	tons (metric)
Peru	22	tons (metric)
Ecuador	63	tons (metric)

The United States appears to be a minor factor in the trade in South American bark, most of it going to Europe.

The following communication to Dr. J. J. Durrett from Dr. P. B. Dunbar, Assistant Chief, Food and Drug Administration, United States Department of Agriculture, is of interest in connection with the cinchona supply of the United States and the composition of the malaria remedies on the market, some of which are known commonly as "chill tonics."

"Most of the cinchona bark entering this country comes through the port of New York. I, therefore, requested our New York office to furnish whatever information relative to imports is available. Our stations do not attempt to examine all consignments of cinchona bark offered for entry. It is estimated that between 60 and 80 per cent of such importations are examined by our laboratories. We would have no records of importations which are not sampled. During the past five years, we have examined samples from

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*Report of the Subcommittee on Sources of Remedies for Malaria, Professor W. T. Dawson, Chairman.

*From the Department of Pharmacology, School of Medicine, University of Texas.

consignments totaling 410,000 pounds. Of this amount 2300 pounds were denied entry because of low quality. The rejections, therefore, amounted to approximately one-half of 1 per cent of the goods offered for entry.

"In 1928 this Administration inaugurated a systematic survey of preparations on the market labeled as treatments for malaria. We had, of course, given consideration to medicinal preparations generally, including those represented as treatments for malaria, from the date of the passage of the Federal food and drugs act. I find in our files 122 notices of judgment which include references to malaria among the label statements alleged to be false and fraudulent. Many of these notices of judgment relate to products of the 'cure-all' type in which malaria is not emphasized beyond the numerous other disease conditions for which the products were offered. Many of the notices of judgment, on the other hand, are based upon the alleged misbranding of products offered primarily as treatments for malaria.

"Of course, not all of the preparations which have been considered by the Administration are represented by notices of judgment. When our intensive survey of malaria preparations was inaugurated, many manufacturers voluntarily submitted the labelings for their preparations to the administration for comment. In this way a considerable number of them were given consideration without the formality of a legal proceeding.

"The compositions of the numerous drug products we have examined varied widely. Most of them contained quinine or other cinchona alkaloids. In many instances, however, the proportion of such alkaloid was considered too low, in the light of the dosage recommended, to constitute an adequate treatment for malaria. Other ingredients often found in these preparations are powdered iron or a soluble iron salt, and laxative drugs. Among the laxatives found are Epsom salt, the emodin-bearing drugs (cascara sagrada, senna, rhubarb, aloe), phenolphthalein and podophyllum oleoresin. Arsenic and strychnine also are ingredients of some of these articles."

A very important discovery has been announced within recent months by Dr. Paul Rabe, the eminent German chemist, called to our attention by Dr. Concannon. The search for a method of synthesis of cinchona alkaloids has at last been successful (Berichte, 64:2487, 1931). While quinine has not yet been synthesized, hydroquinine and hydroquinidine have now been produced by complete synthesis. These alkaloids are considered by the German authority, Giemsa, as at least of equal value to quinine in the treatment of malaria. It is possible that these alkaloids cannot yet be synthesized on a commercial scale at prices that would enable them to compete with quinine, but it is certain that German chemists will attempt to make commercial production possible. In this country Bevil (*Amer. Jour. Trop. Med.*, 12:473, 1932) has recently reported favorably on the value of hydroquinidine in the treatment of malaria.

Within recent months favorable reports have appeared on the antimalarial activity of a new drug, atebrin or atabrine, stated to be a complex derivative of the acridine series, and of another preparation of somewhat similar name, tebetren, stated to be a combination of hydroquinine and methylacridine, (Lancet 2:565, 1932), and also of a quinoline derivative, R 118 (Klin. Wchnschr. 10:987, 1931). The formula of plasmochin, previously kept secret, has at last been disclosed (Klin. Wchnschr. 11:381, 1932).

It is clear that there have been, during recent months, developments in the field of organic chemistry that are of great interest to everyone concerned with the treatment of malaria.

MALARIA MORTALITY IN THE SOUTHERN UNITED STATES, 1931*

By ERNEST CARROLL FAUST, PH.D.,
New Orleans, La.

A year ago the writer presented to this Committee the status of malaria in the South, determined by the mortality rate for 1930. The data indicated that decrease in the malaria death rate had occurred in recent years, although in certain areas the situation was essentially the same as it was a decade ago. In fact, in a few states rates in excess of 10 per 100,000 population had increased within the decade. As a whole there was adequate evidence to indicate that malaria was still a public health problem in many regions of the South.

The record for the year 1931 has been compiled by states and by counties and is now available for review. Of the 14 states within the area (Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Missouri (southern 3 tiers of counties), Arkansas, Louisiana, Oklahoma and Eastern Texas), all but three showed a decreased death rate from malaria for 1931 (*Table 1*). The rate for North Carolina is higher by 0.1, for Texas by 0.54, and for Missouri by 5.62 (or more than one-third). In considering the data by counties these three states show an increase in the number of counties reporting more deaths than in the previous year. Moreover, in Arkansas, with a marked reduction in the death rate for the State as a whole, there is a 44 per cent increase in the unfavorable county group. Relatively few of the counties reporting deaths for the year 1930 had the same record for the year under consideration; deaths either increased or decreased. On the other hand, large percentages of counties in Virginia (83 per cent), Kentucky (75 per cent), North Carolina (62 per cent), and Tennessee (53.7 per cent) had no deaths from malaria for the biennium 1931-1932.

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*From the Parasitology Laboratory, Department of Tropical Medicine, Tulane University School of Medicine.

Table 1

STATE AND COUNTY DEATH RATES FOR MALARIA FOR 1931

State	1930	1931	Counties with Increased Deaths	Per Cent of Whole	Counties with Decreased Deaths	Per Cent of Whole	Counties with Same No. of Deaths as in 1930	Per Cent of Whole	Counties without Deaths for 1930 and 1931	Per Cent of Whole	Total Number of Counties
Virginia	0.62	0.5	5	5	10	10	2	2	83	83	100
North Carolina	1.4	1.5	17	17	18	18	3	3	62	62	100
South Carolina	19.26	13.6	13	28.2	21	45.6	6	13	6	13	46
Georgia	15.20	10.5	36	22.3	54	33.5	20	12.4	51	31.6	161
Florida	21.67	13.6	15	22.3	36	53.7	10	15	6	9	67
Kentucky	2.1	2.0	14	11	13	10.8	3	2.5	90	75	120
Tennessee	5.4	5.3	17	17.8	21	22.1	6	6.3	51	53.7	95
Alabama	11.27	8.1	17	25.3	36	53.7	9	13.4	5	7.5	67
Mississippi	13.9	10.38	22	26.8	45	54.8	9	11	6	7.3	82
Missouri	15.4	21.02	12	36.3	7	21.2	1	.03	13	40	33
Arkansas	36.3	26.9	11	14.6	44	58.6	16	21.3	4	5.3	75
Louisiana	8.5	6.8	18	28.1	32	50.0	5	7.8	9	14	64
Oklahoma	5.27	3.5	15	20.2	24	32.4	5	6.8	30	40.5	74
Texas	3.66	4.2	50	29.4	45	26.4	6	3.5	69	40	170

MALARIA MORTALITY IN 1931

Regions Showing Marked Increase

	Mortality Rate	Increase Over 1930
(1) Georgia		
Crisp County	62.8	22.3
Early County	59.4	31.9
Liberty County	121.7	71.7
McIntosh County	121.0	68.5
(2) Missouri		
Butler County	79.3	20.23
Dunklin County	74.2	9.96
New Madrid County	49.5	19.76
Pemiscot County	96.2	39.88
(3) Arkansas		
Greene County	39.1	27.1
Montgomery County	65.0	65.0
Perry County	79.2	51.2
(4) Mississippi		
Quitman County	54.1	22.5
(5) Louisiana		
Madison Parish	52.2	18.7
(6) Oklahoma		
Pushmataha County	61.0	35.0
(7) Texas		
Gregg County	88.8	82.5

On the other hand, the following had important recessions:

Regions Showing Important Recessions

	Mortality Rate	Per Cent Reduction
(1) South Carolina		
Beaufort County	96.0	78.42
Berkeley County	53.9	90.1
Georgetown County	50.6	46.21
Jasper County	30.3	39.7
(2) Georgia		
Baker County	37.8	79.2
Bleckley County	21.6	88.4
Jenkins County	53.8	154.2
Lee County	47.8	77.2
Mitchell County	29.1	42.4
(3) Florida		
Citrus County	107.1	92.9
Dixie County	159.4	140.6
Gadsden County	42.3	46.7
Jefferson County	37.3	93.7
Lafayette County	22.7	73.3
Levy County	70.3	113.7
(4) Alabama		
Greene County	20.1	30.45
Montgomery County	9.6	20.67
(5) Mississippi		
Bolivar County	15.1	13.0
Coahoma County	27.7	17.6
(6) Arkansas		
Ashley County	11.9	38.1
Bradley County	28.6	37.4
Desha County	41.3	30.7
Drew County	25.1	49.9
Hot Springs County	11.0	43.0
Jefferson County	32.7	27.3
Lincoln County	29.6	45.4
Little River County	19.3	74.7
Miller County	29.4	27.6
Phillips County	63.9	61.1

On the whole the year 1931 has shown a notable decline in the area, with only one large section (Southeastern Missouri) seriously departing from the favorable showing which it had made during the previous decade.

OBSERVATIONS ON THE APPLICATION OF MOSQUITOES IN MALARIA THERAPY*

By BRUCE MAYNE,**
Columbia, S. C.

When one investigates the cost of potentially infective mosquitoes one realizes that unstinted care is necessary in transporting these precious lives. When mosquitoes are to be transported for therapy, they should be personally conducted. In England, where the distances in any quarter are never greater than 24 hours apart, anophelines are given a caretaker none other than the assistant director of the malaria laboratory. The insects are conveyed in lots of about fifty in wide-mouthed cylindrical glass museum jars, with one end netted. There appears to be no effort to conserve the specimens in an ice container while en route. Of course the summer conditions there differ from ours. Here we employ a portable refrigerator maintained at a temperature, if possible, of 40 to 50° F. When more than one day's travel is necessary, the ice container must be replenished. The insects are preferably kept in individual diminutive lantern globes of the sort employed in routine biting in the base hospital. The original record number is retained throughout the life of the insect and pertains to its character, contacts, and performances. Where possible, the following has been the procedure adopted:

When a number of patients require treatment, each is bitten by every available mosquito of the batch which can be induced to attack the host. An interruption ensues at intervals of thirty seconds, using the same insect until it refuses to bite. Usually it is permitted to engorge itself on the final host. When only a single host is offered, the mosquitoes are applied singly and immediately dissected. If the salivary glands of a test mosquito show an abundance of organisms, the biting is discontinued, and where possible the glands are injected in a suspension of sodium citrate into the vein of the patient. In this connection, conservation of material may be effected, if desirable, by using one patient to receive the bites and another for the intravenous injection of the suspension of salivary gland sporozoites. Of course one can readily appreciate the desirability of an abundance of infective material.

Although it is preferable to employ bred mosquitoes, no serious objection can be made to the use of wild collected adults if it is reasonably certain that they inhabit a malaria-free locality. The rare finding of an indigenous strain of plasmodium in any captured anopheline found in a temperate zone, like that offered in the non-malarious districts of Great Britain or the United States, should not preclude the use of this supply if serious difficulties are encountered in the collecting of more suitable material. However, the English workers are the only ones I am acquainted with who regularly employ uncultivated mosquitoes. While beginning our work in Columbia, we found it useful to employ captured anophelines; but we soon exhausted the supply and found it more advantageous to permit the captured females to multiply. It is not a difficult matter to remove the eggs laid overnight, and with suitable food the larvae develop quite normally in the shallow trays to the pupa stage. Of course one must be on the alert and bag the pupae before they become a winged domestic pest. The procedure here is to separate the pupae daily, placing them in shallow saucers surmounted by netted globes.

In general, both high temperatures and high relative humidity favor development of the mosquito and the parasite it harbors. But the production of fungi and bacteria are also favored. These are principally saprophytic and tend to inhibit full functioning.

We have concluded that the optimum temperature and likewise the optimum relative humidity for maintenance may be placed arbitrarily at 70 to 75° F., and 60 to 75 is the percentage of humidity. When it is advantageous to accelerate the development of individual specimens for test purposes, the temperature and humidity may be heightened. Then a proper incubator is essential. On the other hand, if maximum longevity of the product is sought, the lowest temperature and relative humidity permissible are advantageous.

The method formerly employed of collecting large numbers of nondescript larvae and pupae from natural waterways has the disadvantage that the larvae cannot be dissociated from the larvae from accompanying predatory forms which are collected unavoidably, either in the egg form or more advanced stages. Here much loss unconsciously results. Then, also, there is the bother of either identifying each larva or awaiting emergence of the winged insect before one recognizes the species actually present. The advantage offered is possible saving of time when a small batch of insects is required for immediate use. All of this, of course, relates to a district reasonably well stocked at the proper season.

Probably the greatest difficulty one encounters in maintaining an all-year-round service station for malaria therapy is the paucity of material during the dormant season. One must store a reserve stock of material during the fall to anticipate the winter requirements.

Where one is equipped with a sub-tropical insectory, the winter period presents no problem, as an open season for mosquitoes is perennial. Otherwise, in the ordinary conservation of material, a substantial cold chamber is an important adjunct. Mosquitoes can be stored unfed for six weeks to two months at temperatures averaging 50° F. Another means may be available, and that is the conservation of anopheline eggs at lowered temperatures. We have found it possible to store eggs in a cold chamber provided at the Columbia institution at temperatures ranging from 38 to 42° F.

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in a healthy unhatched condition for periods of five to seven weeks. At the termination of this period, when exposed to the living room temperature of 74 to 76° F., they were observed to hatch in never less than three days and develop into apparently normal anopheline mosquitoes. Incidentally, while experimenting with the temperature necessary to conserve the egg stage, a range of temperatures from 48 to 62° F. was found unfavorable, inasmuch as these temperatures did not inhibit protracted incubation. The eggs appeared to hatch within five days when subjected to these conditions.

A more satisfactory though slow criterion of virility of the gametocyte is the appearance on the second or third day of the zygote on the gut wall of a test mosquito. Of course this is not infallible, because a change in the patient's blood may occur in the interim of awaiting the appearance of the initial pigmented forms in the mosquito.

It has been my experience that in judging the optimum conditions for the insect carrier, multiple infective feedings are decidedly advantageous up to six bitings. We have applied mosquitoes in many instances up to 12 times, but the disadvantages are judged to be too numerous: chiefly, the rapid contamination due to the bacteria and fungi; the agitation necessitated in too frequent handling, causing enfeeblement; and last, the important consideration of repeated discharging of accumulating sporozoites into the carrier patient, causing reinfection, the value of which is questionable.

One often encounters the optimistic report that certain strains of malaria, both tertian and quartan, may, however, be lacking in gametocyte formation, that artificially induced malaria cannot be transmitted by the mosquito. This must be given the consideration it deserves. It is admittedly not an easy matter to produce a batch of vigorous mosquitoes, maintaining them for an unlimited period in a state of infectability, but we have met with partial success after inducing anopheline mosquitoes of four American species to engorge themselves with the blood of artificially inoculated plasmodia. However, workers agree that there are "good infectors" and "poor infectors," as Colonel S. P. Jones has indicated, and what the criteria are one is at a loss to ascertain. For example, the test is recommended that blood from a suitable carrier ("good infector") produces exflagellation, beginning of conjugation, observed in drawn blood in the presence of optimum warmth and moisture. Darling's dictum, the presence in blood of an average of one gametocyte to 500 leucocytes, is not applicable to other types of malaria, particularly the benign tertian, because one may obtain infected mosquitoes when the phenomenon of exflagellation cannot be demonstrated. Mosquitoes may fail to carry on the plasmodium life cycle in the presence of numerous developed gametocytes, and have been proven to exhibit infectivity in the presence of as few as one gametocyte to 1,100 leucocytes. For example, in early attempts with naturally induced malaria, I had not succeeded in producing a single infected mosquito with a presumably good crescent carrier, malignant tertian, using a total of 219 anophelines; and recently, a series of 338 specimens failed to infect with quartan malaria when applied on various occasions to as many as 7 supposedly suitable cases, when as many as 12 bites were given several of these anophelines.

Not many investigators believe that induced malaria takes on all the characteristics of the natural disease. Certainly it reacts differently to specific treatment and exhibits important parasitological characters at variance with the indigenous strain. For example, one observes particularly with quartan malaria an extraordinary degree of phagocytosis, sufficient to tempt one to wonder if this phase does not contribute in some measure to the difficulty in infecting mosquitoes. Again, one observes in the tertian species the tendency for early gametocyte production. It is quite common to observe half to full grown gametocytes upon the initial appearance of parasites in the patient's blood. Also, it is possible that one can infect mosquitoes earlier. For instance, we infected a batch of mosquitoes from the blood of a patient upon the second day of parasite appearance.

In the induction of malaria the two methods in vogue, blood transfusion and mosquito biting, may well supplement each other. It is customary before a strain of malaria parasites can be established in an institution where the principal mode is intended to be by mosquito application, to obtain a supply of blood and inject it into a patient selected for malaria therapy. Thorough microscopical tests should be made before the strain is adopted. One is continually confronted with the possible presence of a mixed infection from a new source. Also, it is not uncommon for an old infection, latent in the patient, to flare up as a result of a few paroxysms accompanying the induced strain. Two such instances have occurred in my limited experience. In these, mosquitoes had been used at different times to convey a vivax strain. After about six paroxysms, the microscope revealed the presence of asexual forms of the malignant tertian parasites. Interesting to relate, the virulent organism predominated and in one instance superseded the vivax forms completely; death supervened. The obvious moral: the microscope should be resorted to more frequently.

The syphilologist reminds us of the danger of disseminating neurotropic strains of the pallida organism when blood is transferred from one paretic to another. The malariologist warns us of the possibility of transmitting mixed strains of plasmodia. The pathologist reminds us of the occurrence of pathogenic streptococci or other forms of bacteria in blood used for malaria transference; the clinician of the occasional anaphylactic shock accompanying the intravenous method of blood transfer. We are cautioned to avoid these disturbances by utilization of blood from reservoir hosts who are non-syphilitic donors; by employing properly grouped matched blood; and lastly, by the natural method of induction through the mosquito.

Employment of the mosquito in malaria therapy unfortunately takes this method out of the hands of the

clinician and places it under the supervision of the trained biologist. At the present time even the skilled clinician fails to understand why the feeding jar should not be violently agitated in an effort to accelerate the parasitism of the infecting insect; why the jar containing the mosquito removed in the hospital from the portable refrigerator should not be placed on the convenient hot radiator to arouse it from its seeming frigidity; why the operator should not place a dozen or more of the small feeding jars against the convenient anatomy of the willing or unwilling insane patient and impatiently anticipate the immediate attack of the presumably starved blood sucker. No, we shall have to call on the trained worker who can elicit the proper cooperation of both host and parasite in the onerous task of malaria transmission by the bite of the mosquito. An objection offered to the application of the insect vector is the reported greater tendency of relapsing, that fully 50 per cent of patients, acquiring malaria in this manner, suffer a recurrence in the course of two years after the termination of treatment. The question arises if this relapse is not a blessing in disguise, acquiring a certain advantage as a supplementary spirichetocide.

Admittedly, the trained biologist adds to the cost of treatment. However, his work is definitely a special job. The new investigation involving the use and preservation of the insect's gland sporozoites still claims the assistance of specially trained personnel.

The obvious advantage of employing mosquitoes is, then, portability, and also carrying over the maintained virus for long period when blood is unavailable.

The matter of viability and resistance of the sporozoites in the mosquito is engaging our attention at present, on account of the possibility of using sporozoites in suspension in various media, and thus obviating the difficulty of carrying live mosquitoes from place to place. This work has been inaugurated in the South Carolina State Hospital, and for the first time we have been successful in producing malaria by inoculating patients with sporozoites in citrate suspension.

Up to the present time we have tried out preservation of sporozoites with a variety of sugars, glycerin, citrate, and ordinary physiological salt solutions, and find that the sporozoites, however resistant in the mosquito, is easily destroyed *in vitro* when in contact with these reagents. It may be pointed out that sporozoites persist in a mosquito long after its death, and we have recovered sporozoites from dead mosquitoes fully 48 hours—more recently 65 hours—after the insect has died. Also, we have shown that in the mosquito, though it may be killed by heat at a temperature of about 43 to 45° C., the sporozoites, on dissection, show viability. We have seen that to kill the sporozoites it is necessary to apply heat very close to 50° C. (122° F.).

DISCUSSION (*Abstract*)

Dr. L. L. Williams, Jr., U.S.P.H.S., Washington, D. C. Dr. Mayne has been carrying on biting experiments since 1915 and has made a large number of observations.

Only the larger psychiatric institutions have been able to keep alive a strain of malaria by transfer from patient to patient. The larger institutions, from time to time, have lost the malarial strain they were using in the therapy of paresis. Methods of resupplying such a lost strain and of supplying a strain to the smaller institutions would seem properly to constitute a field study. It was not known how long malarial blood can be stored and still remain infective. Malaria can be kept alive in an infected mosquito, but what are the best methods of prolonging the life of an infected insect, and is it possible to store sporozoites outside of the mosquito? When the mosquito is properly cared for and its life prolonged, how long will the infection remain? If the mosquito is to be the only storehouse for infection, how should mosquitoes be shipped and how used upon arrival? The large number of problems encountered in developing the service to hospitals can readily be seen. Such studies require a place where a constant malarial infection can be secured. When the method has become simplified and when a method of measuring the infectivity has been devised, then such a service as he has described would, and doubtless will, become a commercial activity.

Dr. Mayne has mentioned the public health aspect of releasing carriers into the general population. In years gone by malaria was prevalent in the United States from Canada to Mexico. In the Mississippi Valley it is now practically confined to that portion from the southern part of Missouri to Mexico. Malaria is no longer found in the North because conditions there render it impossible for the disease to maintain itself. Continuance of these conditions will, I believe, effectively prevent a return of malaria to the areas now free. With ease and rapidity of travel now prevailing, the relatively large number of malaria carriers from the infected portions of the South annually invade many areas of the North, where malaria no longer prevails. If these carriers have been unable to renew the infection, surely there is little danger to be apprehended from the occasional paretic carrier who may be released from observation while still carrying the organism.

MINOR DRAINAGE IN THE DELTA SECTION OF MISSISSIPPI*

By NELSON H. RECTOR,**
Jackson, Miss.

Tremendous sums of money have been spent in this country and in other countries during the last hundred years in draining swamps, overflowed, and tidal marsh lands, due, primarily, to the increased demands for the products of agriculture. As this demand became greater, the market value of the lands increased, and the potential value of the wet lands made their reclamation feasible.

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Sixth Annual Meeting, Birmingham, Alabama, November 15-18, 1932.

**State Sanitary Engineer.

In the last twenty years many large drainage districts have been established in the Yazoo Delta of the State of Mississippi, particularly in the northern part, and have effected the desiccation of many large swamps. Such districts, however, provide only the major drainage, that is, the principal outlet canals and levees. During the period of subsequent settlement and while the clearing of the woodland is under way, the recently established population suffers severely from malaria fever. As the minor drainage is developed malaria tends to decline as a result of diminishing mosquito production.

In Bolivar County, Mississippi, with an area of 879 square miles, 830 miles of major drainage canals were constructed from 1908 to 1930 at a cost of approximately three and a half million dollars, and during that period, the malaria morbidity rate has shown a marked decrease.

It is not intended to convey the idea that the reduction in this disease was due entirely to the amount of drainage that was executed during this period, as there were several contributing factors. A more extended use of screens has probably been one of the principal factors in effecting this reduction of malaria.

Professor George Pickels, in his book entitled "Drainage and Flood Control Engineering," says: "In 1925, 95 million acres of wet swampy lands still existed in the United States and 4,400,000 acres of swamp land still exist in Mississippi." Professor Pickels also states that out of a total of 18,200,000 acres in farm lands in Mississippi, some 1,450,000 acres are not properly drained.

It has been recognized for a long time that drainage properly executed is an important factor in reducing the incidence of malaria; and for that reason health authorities are not only interested in promoting drainage, but are even more interested in seeing that it is properly executed. The land owner at first may be interested only in the reclamation of lands that can be farmed, while the health department desires the drainage of areas producing the malaria transmitting mosquito. However, if agricultural drainage is extended to such an extent that no low lands are left undrained, the aims of all will be satisfied.

A great mass of literature has been written and is available in regard to the correct way of constructing ditches for agricultural drainage; little consideration, however, has been given to making land drainage effective in reducing the mosquito population and thereby effecting a control of malaria. In too many instances the engineer has not realized that he has actually created conditions that have been responsible for an increase in the malaria incidence, when he could have materially aided the health workers had he known something of mosquito control.

Since April, 1929, the Mississippi State Board of Health has had from one to four engineers in the field, who have devoted their entire time to the promotion of minor drainage. By minor drainage is meant the secondary canals and ditches necessary to reclaim areas left undrained by the main canals. Each engineer has been assigned to two or three counties and he visits them in rotation, spending a week in each county. He works as an additional member of the staff and an integral part of each county health department and at all times keeps in close touch with the respective county health officers.

The program, as worked out for these engineers, is definitely designed to evade competition with the practicing engineers and it is believed that the program in the end will aid rather than injure the engineers. We arbitrarily limit ourselves to projects the cost of which does not exceed $1,500. When it is found that the project will cost more than this amount it is recommended that a practicing engineer be employed. In the first place it is rare, indeed, for the average planter to employ an engineer to lay out the small projects with which we are primarily concerned; and second, our engineers have been able in several instances to assist practicing engineers in the formation of a drainage district.

Where a request comes into the office of a health department for assistance on a plantation or in a small municipality, our engineer makes a preliminary survey of the area in question to ascertain if it seems reasonable that such a project might be successful. If so, he proceeds to lay out the drainage ditches by giving lines and taking levels over the proposed line of the ditch. He then furnishes the landowner with a grade sheet which indicates the depth of the ditch at each hundred foot station and also a cut from the top of the stake. As the planter knows little or nothing of civil engineering, an instruction sheet is also enclosed. This sheet indicates clearly how he can check his ditch at each hundred foot stake to determine when he has reached the proper depth.

In several instances it has been necessary for the engineer to supervise the construction of the ditch.

When we finish the survey our part is usually completed and the cost to the State Board of Health ends. The individual or town then takes steps to execute the drainage, hence, the one directly benefited bears practically all the cost of putting in the ditch.

Our program is well adapted for a county health department. Practically 100 per cent of the planters interviewed during the last year approved of the program and it is rare, indeed, to find one that does not think the work worth while. In each of these counties there are many persons who call on us when they plan to do any drainage. The engineering work has often been an entering wedge for other activities of the county health department. Frequently planters ask for information in regard to the installation of the sanitary toilet and want to know the cost of screening tenant houses. In this way we have seen sanitary privies built and screens installed on plantation farm-tenant-homes where the planter first became interested in executing drainage. In the same way we have received some of our best prospects from members of the staff of the county health department. And let me say right here, no activity of any county health depart-

ment is successful if it does not create more work for other divisions of the department.

The planter is also taught some of the habits of the mosquito. He can readily be made to see the reason why small ponds or swamps lying in close proximity to dwellings constitute a greater menace to the health of the plantation than larger swamps lying farther from the houses. A number of plantations have been seen where the incidence of malaria could have been markedly reduced by draining these small areas. By so doing we would have forced the female mosquito to make a longer flight from the pond where she was bred to the dwelling where she obtained her blood meal and would have to make the same trip returning to deposit her eggs. By thus forcing her to make longer flights we are increasing the hazards incident to the journey and as a result a larger percentage of adults will be killed. Keeping this one fact in mind will do much to reduce the malaria incidence.

Another important aspect of this service lies in securing the coordinate efforts of many diverse agencies. A drainage project, even of minor character, frequently involves the cooperation of the drainage district, levee board, highway department, and the railroad authorities before it can be accomplished. In all cases, where requested, this has been effected.

In the Mississippi Delta the sixteenth section lands are designated as school lands and the income from them goes to the maintenance of the school system. In many of these sections large areas remain undrained. However, in several counties the county officials have made it possible for us to drain swamps on school lands by the use of county convicts. One such area in Leflore County has been ordered drained by the use of convicts. A ditch less than one-half mile in length will drain a forty-acre swamp which, according to old inhabitants, has never been dry. This piece of work will constitute a distinct contribution to the public health of this community, as approximately one hundred people live within flight range of the mosquitoes from this swamp. In addition to draining this swamp, this ditch will constitute an outlet for several small ponds in the vicinity.

Mention should be made of another method in the control of mosquito propagation that has been used to advantage in several towns and cities. Several ponds in these towns have been eliminated by filling with municipal garbage and trash. The City of Greenwood, Mississippi, has completely filled a two-acre pond by this method. This City estimates that there have been 50,000 truck loads of garbage and trash hauled into this pond during the last two years. Since it lies nearer the center of the City than the previous garbage dumps, it can readily be seen that the City has been able to reduce the cost of hauling its wastes and at the same time has transformed an unsightly pond into what will eventually be valuable building lots. At any rate, an area of two acres which constituted a menace to public health has been abated and at no additional cost to the town.

The importance of having an engineer lay off the ditches in the Delta section of Mississippi is realized when one learns that the average slope in this section is approximately one foot to the mile. In several instances we have been forced to lay off ditches with a grade of six inches per mile.

When the fall is so slight planters or even experienced drainage men (engineers, if you please) cannot estimate the fall between two points lying one-half mile or more apart with any degree of accuracy. In several instances planters have stated that they had lost from $25.00 to $300.00 by running their ditches by guess work. Now these same men call on us when they contemplate doing drainage.

The following table is a summary of the drainage work that has been completed in the Mississippi Delta for the period of April, 1929, to October 31, 1932:

MINOR DRAINAGE WORK DONE IN THE MISSISSIPPI DELTA

Totals to Date

Number of plantations on which surveys were made	310
Number of plantations which have completed work	164
Total number of surveys	966
Total length of surveys (miles)	432.8
Total length new ditches installed (miles)	71.1
Total length rechanneled (miles)	90.65
Total length put to grade (miles)	161.75
Length of tile laid (miles)	1.9
Total number of ponds filled	9
Culverts put to grade	31
Total reclaimed acres	12,519.85
Total cost of work	$33,857.38
Number of planters who have been personally interviewed and offered this service	1,440

It will be noted from the above summary that the length of tile laid during this period is relatively small. Much of the farm tile that was laid fifteen years ago has become completely clogged. Realizing that it is extremely difficult to lay tile in a section where the grades are so slight, the health departments have not pushed this type of drainage.

TABLE OF COMPARATIVE COST

Year	Cost of Ditch per Mile	Cost of Drainage per Acre
1929	$981.68	$14.21
1930	364.02	8.45
1931	205.40	2.01
1932	38.64	0.47

It will be noted in the above table that the cost of executing this work has steadily decreased since 1929. This fact can be readily explained, as the ditches now are much smaller than those installed in 1929, and the cost of the labor and material has been greatly reduced. During the last year the greater part of the ditches have been installed at an exceedingly small cost; much of this work has been executed with labor which worked for either its food or its food plus a small money wage. The ditches cost nothing on several projects that were recently completed, due to the fact that the county loaned its road equipment to the planters.

It is confidently hoped that with a continuation of the present program much of the land that is lying out in swamps and bayous will be completely drained

in the near future, so that the planter may benefit by increased yields at lowered cost of production. Profitable results may be expected from the cultivation of virgin soil and the employment of labor healthy because of a greatly lowered malaria incidence, due to reduction of the mosquito density resulting from the elimination of the area in which mosquitoes formerly bred.

We are urging the planters to grow cotton and corn in the areas where they have been raising mosquitoes.

Discussion follows paper of Mr. Clarkson, page 464.

MALARIA CONTROL IN GEORGIA BY CONVICT LABOR*

By L. M. CLARKSON,**
Atlanta, Ga.

Forty-eight years ago Lavaran expressed the hypothesis that the mosquito might be the vector of malaria, and thirty-five years ago Sir Ronald Ross discovered the multiplication of malaria parasites in the stomach of the mosquito. Prior to this period there were many fantastic theories relative to malaria transmission and methods of malaria control. After analyzing this hypothesis, we cannot but place especial credence upon two fundamentals, namely: first, that at least in most states the *Anopheles quadrimaculatus* is the chief, if not the sole, vector of malaria; and second, that quiescent ponded waters are preferential for propagation of the *Anopheles quadrimaculatus*. These two basic facts provide a foundation for constructive malaria control and reduce an ancient vexatious problem to a simpler one applicable to drainage only of certain specific waters. It makes no difference that quinine for hundreds of years has been held as a reliable specific for the disease. It is prevention that we need more than we need cure. And so we adopt as our slogan "A Ditch in Time Saves Quinine." With these modern fundamentals incriminating the *Anopheles quadrimaculatus* and defining its preferential habitat, drainage of only such waters as are preferential for the quadrimaculatus becomes our definite problem in malaria control today. If any malariologist, health officer, or a sanitary engineer is asked to state the most effective, the most permanent, and consequently in the end the most economical method of malaria control, the answer will be "drainage." Theoretically we all subscribe to malaria control by drainage, but actually we are afraid of the cost. We dare not ask the price of drainage, yet we admit that it is indispensable. There is not one among us who prefers rather than drainage such methods as quininization, screening, oiling or Paris green dusting, though financial circumstances often force us to follow the course of least resistance and recommend a substitute for drainage. We all admit that we have done beneficial work with other methods, but we could have done better with drainage. When a human life is in the balance a physician is certainly expected by both the patient and family to recommend the most efficacious treatment regardless of cost. Why, then, should not the health officer, practicing prevention, state to the public that though quinine and certain other methods are beneficial, he stands for prevention of the propagation of the insect regardless of cost. This policy should be established as public health ethics. This policy should be the creed of both health officer and sanitary engineer and should the National Malaria Committee adopt it, the anopheline army would quickly request an armistice. Such, however, may seem to you only extravagant idealism. My prediction that some day the southern United States will be malaria-free due to drainage may seem like the present-day prophecy that "Prosperity is just around the corner;" but it is within our power. It behooves the National Malaria Committee to crystallize sentiment and to accelerate use of this method. The question, then, is how can we reduce the cost of drainage, to popularize the method and overcome economic difficulties. When homes are being lost, farms abandoned and taken for taxes, agriculture is sinking further into the mire of debt, business in distress and ten million men and women are asking for work and unable to find it, how can it be done? Not by drainage districts when drainage bonds are not marketable and when farmers are unable to meet property assessments. Furthermore, drainage districts are more adaptable to agricultural reclamation. Agricultural drainage and malaria drainage are very often extremely divergent in both plan and purpose. Agricultural drainage is more general; malaria drainage is more specific. Why combine the two and assess one at the expense of the other? We do not deny the fact that agricultural drainage often reduces malaria, nor that malaria drainage certainly benefits agriculture, but each problem is too scientifically precise in itself for practical coordination. Moreover, ask anyone of experience with drainage districts and you will be convinced of the unpopularity of drainage districts. Regardless of the success of certain drainage districts in the past, the present value of farm property makes the cost of drainage districts prohibitive. Now about selling the idea to the farmer of doing his own drainage! In this the writer has met with some success, but admits failure to establish county-wide drainage. Others may have succeeded and they should be commended. In Georgia rural drainage for malaria control, until recently, has been the most difficult of all public health problems to sell to the public and the problem has seemed insurmountable. May I digress here with a brief account of urban malaria control in Georgia before describing our plan of rural malaria drainage by convicts?

It was not until the year 1920 when a Division of Sanitary Engineering of the State Board of Health

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**Chief, Division of Sanitary Engineering, State Board of Health.

was established, that urban drainage for malaria control was systematically established under State Board of Health supervision. At this time malaria was certainly a very serious public health problem in towns and cities. The initiation and carrying forward of this work depended upon the efforts of a sanitary engineer periodically to visit the towns and cities for malaria investigations. Public interest was stimulated; local personnel was trained and supervision of drainage and other methods of control became important functions of the Division of Sanitary Engineering in towns and cities. Twelve years of urban malaria control in Georgia has reduced our urban problem to a minimum, leaving rural and community malaria still an extremely serious public health problem.

In view of only recent inception of rural malaria control we prefer to look with confidence to the future rather than to claim accomplishments of the past. We at least take cognizance of the fact that there can be no controversy over the most effective method and that is prevention of propagation of the insect. This method has been established in Georgia and we believe it will remain incontrovertible. No inference is made, however, that other states have not practiced and are not now practicing effective malaria control by various methods. As an ideal we would prefer to combine with drainage methods practiced in other states.

You recall the old axiom, "Necessity is the mother of invention." On this principle was built the foundation of our present malaria control program in Georgia. We were challenged to meet a public health emergency. We accepted the challenge and the public is receiving considerable benefit.

In 1929, in our malarious section and at an unpropitious season, there was an exceptionally heavy rainfall. The result was a great surplus of residual surface water. Nature failed to endow this section with proper provision for rainfall run-off. By such geophysical failure this section is interspersed with physical depressions, locally termed lime-sinks. These depressions which hold residual rainfall are, by their very nature, preferential habitats for *Anopheles quadrimaculatus*. Fortunately however, most of these depressions are adaptable to drainage. A graphic curve of annual rainfall coincides with remarkable consistency with malaria mortality and malaria epidemicity. The malaria control method then necessary is satisfactory drainage to permit more rapid rainfall run-off. Physically the problem is not difficult. Financially it is extremely difficult. That year with malaria deaths by counties running into the thirties and forties and malaria cases by counties running into the thousands, public sentiment for state malaria control action was aroused. Demands for relief were made by the public. The prestige of state public health was in the balance. Consequently, it devolved upon the State Department of Public Health to discover methods and means to alleviate this rural crisis. We met with county boards of health and county commissioners to discuss the problem. Neither counties nor state had finances for malaria drainage. We may express this inconsistency thus: "Millions for highways, but not one cent for sickness," which, evidently was the parent of our thought: "Monetarily we are poverty-stricken, but in labor we are rich." With conviction of the practicality of the use of convicts for malaria drainage, our next problem was to sell the idea to county officials. The chief difficulty encountered was that convicts had never been used for such work and it was generally believed to be illegal. This contention was met with wherever an attempt was made to promote the plan. It then became necessary to obtain a written decision from the Attorney-General relative to the question. His decision was that "Convicts could be used in Georgia on any type of public works not in competition with free labor." Of course, due to lack of money, there was no possibility of using free labor for malaria drainage, so it could not compete with free labor. Furthermore, the use of convicts for highway work is in fact more in competition with free labor than their use for malaria drainage. So this obstacle was removed.

Convicts had been used in possibly two or three counties on reclamation drainage, and possibly to some extent for minor drainage around towns and cities. This discussion outlines only general rural hand labor drainage specifically by convicts for rural malaria control in counties and its establishment as a general policy throughout the State.

Establishing the first county under this plan was fraught with difficulties. It not only involved selling the idea to county officials, but to the general public also. Long experience has taught us that county officials are extremely hesitant in diverting to any extent from a long-existing narrow routine, without public demand. Consequently, the desire of the public must be manifested or an appeal to county commissioners will be of no avail. When sufficiently interested, county voters can exert a mighty influence. When people suffer from a preventable disease and yet a county's potential wealth is in its convict labor, there is no room for compromise. In promoting this plan we continuously expounded one fundamental truth, namely: "Malaria control does not cost money. It costs labor." Consequently, even in the poorest county, if the county has a potential wealth of convict labor, there is no excuse for additional economic loss, mental anguish and physical suffering. This was our appeal in initiating the use of county convicts for malaria drainage. This plan was finally accepted by one intrepid county with the result that soon the second county ventured, then the third, and today there are 25 counties in Georgia using convicts and road machinery for malaria drainage. In 1931, 314 ponds were drained, comprising approximately 10,000 acres, necessitating about 135 miles of ditches and canals. In 1931 occurred the first full year's operation under two district sanitary engineers furnishing engineering assistance to the counties. Totals for 1932 will exceed those for 1931.

An interesting item in connection with the general plan is that 7 of these 25 counties are now making use of drainage machinery, that is, drag line dredges and steam shovels. During last year 147,569 lineal feet of

drainage, or approximately 28 miles, was constructed by machinery. Due to considerable variation of drainage conditions, drainage machinery is very desirable in certain counties, especially where large cross-section excavation is necessary. Major drainage first by machinery providing a canal system for lateral minor malaria drainage is the general routine in certain counties. County officials are becoming more interested in purchasing drainage machinery. Drag line equipment is valuable for road construction purposes and when a drag line is not being used for this purpose it is convenient to use it for malaria drainage.

Dynamite drainage may be mentioned as another phase of malaria drainage which we have promoted to quite an extent. In addition to the 25 counties above mentioned, there have been quite a few dynamite drainage projects scattered throughout the State. One project surveyed and started within the past month involves about 7 or 8 miles of canal constructed by the use of parallel rows of dynamite and requiring about one and one-quarter pounds of dynamite to the lineal foot. Work of this nature is very spectacular and is very valuable in creating publicity and interest in malaria drainage. We usually have the newspapers take photographs of the dynamite explosions. These photographic newspaper illustrations are valuable for publicity data.

Briefly stated, the plan of promotion of such work involves meetings with county commissioners at regular or called meetings. In selling the plan the point is stressed that we are not asking for money, only for labor; also that engineers will be furnished by the State Department of Public Health to make malaria investigations, followed by drainage surveys. Upon completion by the engineer of his profile grade showing specified cuts, stakes are driven at intervals and a work order sheet given the foreman outlining specifications for the ditches. During construction the project is visited by the engineer to insure satisfactory work. The number of convicts to be used in a county is generally left to the convenience of the individual county. Generally, a minimum gang is about 6. We encourage the use of 15 or 20.

I might digress somewhat to state that during this past summer there were about 15 towns and cities and also a few counties which used unemployed persons for malaria drainage. One of our Georgia counties, together with the county seat, provided approximately 5,000 man days of ten hours for the unemployed. In so doing intermittent work was provided for hundreds of heads of families, sustaining many men, women and children who otherwise would have been objects of charity. This, of course, was a dual service to humanity. It relieved physical suffering and destitution by creating work and it relieved physical suffering and economic loss due to disease.

Now as to the cost of drainage by convict labor, our engineers in planning drainage systems depart from general engineering practice by not making estimates of cost. In fact, we avoid discussing cost of drainage in monetary terms. We prefer to speak of cost of drainage projects in terms of man days. From the actual selling of the idea of the use of convicts for malaria drainage to turning the projects over for construction we avoid using any terms involving estimates of cost or monetary cost values. It would be a grave psychological error. We attempt to impress the public with the statement: "Malaria control does not cost money; it costs labor." Such a slogan is to our malaria campaign as "yeast is to bread" and as "ethyl is to gasoline." The actual selling of this plan to county officials has its humorous aspects. We know that people are naturally suspicious of any plan asserted to cost no money. Often after this point of no cost has been stressed, county officials go into executive session and we are called in to satisfy a contention that we forgot to state just how much money it would be necessary for the county to appropriate.

In the promotion of this work we are particularly careful as we go forward to build our bridges before us. We have learned from experience that if once county officials commit themselves in opposition we must count that county lost. No county official desires a reputation for vascillating. Conversely, they desire it known that a decision once made is final and not to be presented again. Consequently, we must first load our guns in order to drive through the lines of opposition. Then it is necessary to build public sentiment so that county officials are actually sold on the plan before it is up for official approval. After this, if loss of interest is apparent, property owners must be persuaded to attend meetings of county officials requesting drainage on their individual properties. It is also particularly noted that just as individuals are, each county is a problem unto itself. Tact, diplomacy and perseverance must be practiced to the utmost. Local newspapers must create and maintain public sentiment. County officials themselves must be malarially educated and their interest maintained. And above all they must have respect for and confidence in the public health personnel with which they come in contact.

Finally, allow me to say that we realize we have made only a modest beginning. Of approximately 75 very malarious counties in Georgia the work is yet limited to 25, or only one-third. At the present rate of progress let us hope that if we make the job too long, posterity may carry on and eventually make Georgia a more healthful state in which to live.

If it is the consensus of opinion of the National Malaria Committee that this plan has value, I wish to urge that its influence be brought to bear in order that the southern United States may at least partially relieve this great economic loss due to malaria by the least expensive and most logical method, thereby converting crime into benevolence.

In conclusion, we have spent millions to eradicate the fruit fly in Florida, hundreds of thousands to eliminate the cattle tick in Georgia and Florida. The farmers in the cotton belt are spending hundreds of thousands to control the boll-weevil, and yet cotton sells for less than the cost of production. But what are we spending to eliminate the mosquito? Comparatively

nothing. Are citrus fruits, farm commodities and animals of more importance than human beings? Our indifference answers this question. Let us make concerted effort to put our quinine money into drainage. Thus we can eliminate that line on the map below which capitalists regard as undesirable for establishing of industries and building of cities. It is then that we shall collect great dividends from small investments in public health.

DISCUSSION (*Abstract*)

Papers of Mr. Rector and Mr. Clarkson

Mr. J. A. LePrince, U.S.P.H.S., Memphis, Tenn.—In several counties toward the northern end of our present "malaria belt" the practicing physicians have recently informed me that malaria prevalence among the farming population has been higher this year (1932) than in 1931.

Mr. Rector brought out the fact that the land owners in one county in Mississippi spent about $4,216 per mile for major drainage ditches, or about an average of $159,000 per year for 22 consecutive years, or $8.54 per acre under cultivation to date plus maintenance charges. In the same period the total spent by the same county for maintenance of public health work was from 1920 to 1930, both inclusive, about $102,000.

This clearly indicates that the representatives of the banks which sold the drainage bonds can sell their product to the public more rapidly and effectively than we can sell public health to them and indicates the real importance of our spending more time, more money and more mental activity in learning how to sell our product.

The engineering divisions should see to it that every engineer who graduates from the technical schools of the State is taught that it is his duty to reduce malaria in connection with engineering construction operations. The American agencies employing American engineers in the countries to the south of us are yet losing large sums annually in engineering construction operations because of lack of adequate instruction in our American technical schools.

In connection with the impounding of water of rivers for hydro-electric development we can not expect those in charge of construction and maintenance operations to know as much of the details of control measures as we ourselves know. Where those in charge are ready and willing to follow the advice, instructions and requirements of the state health department the desired absence of Anopheles production can and will be achieved, provided the state health officials give the working field forces the necessary information and field instruction. However, if it happens that from shortage of funds, of field instructors, or for other reasons any state board of health of our "malaria belt" is unable to give adequate supervisory assistance to projects sadly in need of it, then who is to be held responsible for the explosive malaria outbreak that generally accompanies these conditions?

Regarding the creation of garbage dumps as a means of reducing municipal garbage disposal expenses, there is a wrong way and a best way to carry on. It is natural for any public works section of a city or town to build high dumps and raise flies and rats galore and take twice as long as necessary to fill the sources of Anopheles.

So far as malaria control is concerned, a dump two to three feet above high water level is just as good as one 10 to 20 feet high and is generally less of a nuisance. If ground area is limited, the dump can be built rapidly in layers. At Panama we fenced in the dumps (barb wire fences) and sprayed the fresh dump surface with thinned watery fermented molasses (over 3 per cent) treated with arsenic. We had very little fly nuisance at the dump and have reason to think the dump acted as a fly collector for the surrounding district. The flies received a deadly jag.

In draining at Panama we had some "zero" grades to tackle and slid by the difficulty in territory near toe hills by (a) connecting tile lines with a branch tile line under pressure fed by ditch or streams higher up, and (b) by inserting wooden lift gates in drainage beds to flush flat creek bottoms and to drown anopheles larvae therein. A native of Holland was told: "You cannot make water run up hill," and he replied: "Maybe not, but I can build a cheap windmill out of waste material which can and will, so what is the difference?"

In much of our flat territory we can use small centrifugal pumps to advantage to spread the water over the parched hot land (hand pump, gasoline driven pump on truck, or use jacked up Ford wheel to give us power) and then the water will not try to run up hill, but will aviate, and the Anopheles crop will not mature.

We can use improvised strainers through which to lead water into sumps, where the cost of clearing the sumps of silt and debris would run too high.

In territory similar to that in which Mr. Rector is operating it so happened that nature placed willow trees on the bank so that they shaded the bed of the narrow bayou (or watercourse) in such a manner as to prevent young willows from growing in the bed of the bayou. Elsewhere along the same bayou there was heavy silting going on (caused by the growing up of young willows). There seems to be an indication that willows can be used or grown so as to stop more willows from growing, and should this prove to be a practical thing to do in many localities the saving in cost of agricultural ditch maintenance will be sufficient to pay for operation of the county unit as well as other necessary public activities.

It was noted by U. S. Public Health Service workers as far back as 1914, and often since then elsewhere, that in North and South Carolina and Georgia in those sections of narrow deep ditches which were shaded by wild honeysuckle growing over the top of the ditch, Anopheles production did not occur, though all along the same ditch up to where the natural shading began and all along its course from where the shading terminated larvae of anopheles were easy to obtain.

Of course it is not the willow tree itself that may be used to stop other willows growing in our flat bottom and wide agricultural ditches, but it is the shade it gives that brings the desired results when the willows are so spaced and situated as to produce a maximum of light shade on the area where we desire to prevent growth. It is quite possible that other quick growing trees of good shading qualities properly spaced and properly situated with regard to the edge of the ditch will give as satisfactory or better results.

Mr. Clarkson has indicated in detail how to proceed in a state where it was thought not legal to use convict labor for eliminating sources of anopheles in rural areas.

Under such conditions, which, by the way, are similar to those of a dozen other states, he has succeeded in a relatively short time in inducing the county commissioners of one-third of the malarious counties of the State to carry on drainage operations and to continue them at this time, when the health workers of most of the states of our malaria belt are busy wondering how they can get any work at all under way.

This mode of procedure has been brought up, to my knowledge, at two of our previous annual meetings, and yet it is probable that Mr. Clarkson, through his personal interest and efforts, has accomplished more along this line than all other officers in charge of state malaria control activities put together.

Mr. M. Z. Bair, Little Rock, Ark.—In Arkansas we are recommending to all of our counties requesting R. F. C. aid to relieve unemployment that they list among needed and useful projects drainage in connection with malaria control. Such projects are admirably suited to R. F. C. aid in that no material is required, and that they can be instituted in the more densely settled rural sections where unemployment relief is most needed. It is realized that many drainage projects will, no doubt, go forward without adequate engineering study, and, consequently, some degree of effectiveness will, no doubt, be lost. The general plan, however, of reviving interest in drainage for malaria control is certainly justified. The delta section of Arkansas has a great number of drainage districts, the largest of which include very large canals. These large ditches were originally planned to remove the excess overflow, and since they are generally laid on extremely flat grades, they practically serve for storing small amounts of water during the entire mosquito breeding season, as the result of which they are undoubtedly responsible for a great amount of mosquito breeding and malaria. Much could be done to relieve this condition by more effective maintenance, which should comprise removal of debris and regrading of the bottoms of the channels in order to secure drying up of the ditches. We are also recommending such projects in connection with R. F. C. relief funds.

While economic conditions for the past few years have made it impractical for Arkansas to finance even minor drainage projects, it is hoped that more of this work will be done as a result of the stimulus given it through efforts to relieve unemployment.

Georgia has given us an excellent demonstration of what can be done with convict labor, and I am sure that many counties throughout the South could put into effective operation a similar program. In Arkansas the number of county convicts available for such service in most of our counties would be too small to carry out such a program satisfactorily. There are a number, however, which, I am sure, could use it advantageously.

This is certainly a proper time to stress the need for drainage in connection with malaria control, as well as more effective maintenance in existing drainage districts from the standpoint of malaria prevention.

IMPROVED RURAL HOUSING AS A FACTOR IN MALARIA CONTROL*

By HOWARD R. FULLERTON, C.E.,**
and
E. L. BISHOP, M.D.,†
Nashville, Tenn.

Although generally the rural home is constructed after quite simple plans, very often because of improper planning, the house provides inadequate protection against the rigors of both summer and winter. Generally it receives too little attention as regards home conveniences, sanitary facilities, the selection of a site and the natural beauty of the landscape; and frequently it lacks the essential safeguards against the insect-borne diseases such as malaria.

With proper home and community planning, rural people may enjoy most of the housing comforts which are provided in the average home in a city.

The Tennessee Department of Public Health has become concerned with the problem of housing and house planning for tenant-farmers, principally in an effort to combat malaria in the rural population. However, the objective has been not only to insure protection against the mosquitoes which transmit malaria, but also to provide essentials of home construction which guarantee maximum comfort in summer and winter, afford convenient arrangement of rooms, and allow economical cost of construction. The study has involved not only details of construction and plans for the individual home, but also scientific grouping of homes and community planning. The latter has been practiced for years in certain European countries, but has received little attention in the United States particularly from the point of view of malaria control.

This discussion will refer to some of the detail's of house and community planning which are believed to be of particular importance in the control of rural malaria and which, with a limited amount of promotional and technical service from state and local health departments, can be provided by the average farm-owner at little or no additional cost.

At present, great numbers of farm houses, especially tenant houses, are built on sites entirely unsuited for the situation of dwellings. The practice is quite common to place tenant houses on plots which cannot be used for cultivation of crops, due to such circumstances as sterility of the soil and improper drainage. The latter condition obviously is of tremendous importance as a malaria problem.

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**Sanitary Engineer, Division of Preventable Diseases.

†State Commissioner of Health.

Fig. 1

Figure 1 shows a three-room tenant house, representative of a large number of houses in the lowlands of Western Tennessee, both in type of construction and nature of location. It is situated quite near a slough, it is practically surrounded by water after every rain and is damp almost continuously during the rainy season. It is one of several tenant-houses scattered over a large farm, but with a minimum amount of forethought and planning on the part of the farm owner, a site could have been chosen, more satisfactory from the point of view of convenience and sanitation and at no additional cost.

While the selection of home sites is of great significance, equally important are details of house construction. The items of faulty construction which are most commonly found in tenant homes may be enumerated as follows:

(1) Wood underpinning which rots and permits the house to sag.

(2) The house so near the ground that it is damp during practically the entire rainy season.

(3) Floors of plank boards which shrink, causing openings which permit the ingress of mosquitoes and other insects.

(4) Outside walls of the box type, where the outside slats, after a time, always become warped, often break and are of little value.

(5) Ceilings of rough lumber and thereby not mosquito-proof. This is of particular significance in that the mosquitoes may pass through the cracks and find a dark harbor in the attic during the day, and return by way of the same route to the room at night.

(6) Roofs, at least over a part of the house, too flat, thereby conducive to rotting of the roofing material and leaking of rain.

(7) Use of metal roofs, and lack of end-ventilation of the gables, which increases the temperature of the house in summer to a very high degree.

(8) An entire lack of appreciation of attractiveness in design.

Figure 2 shows a house which is representative of a large number of tenant houses in Tennessee, and which typifies most of the faulty items of construction mentioned above.

Of course, the types of houses, shown in *Figures 1* and *2*, are not universal on tenant farms, and for a

Fig. 2

number of years, certain large land owners have recognized the economic importance of proper tenant house construction. Unfortunately, however, technical advice has not been sought, with the result that, in general, the newer types of houses, although constructed from the point of view of bodily comfort and disease prevention, have not been entirely satisfactory. Practically no attention was paid to architectural attractiveness.

Figures 3, *4* and *5* show three tenant houses constructed in 1930 by a large land owner in Western Tennessee. The two-room houses were built at a cost of approximately two hundred twenty-five dollars ($225.00) each, and the four-room house about four hundred twenty-five dollars ($425.00).

No one of the houses shown above is attractive in design. The roofs are of such construction and design as to make the houses excessively hot in summer and cold in winter. Ventilation is inadequate, and in two of the houses, the ceilings are too low. No closet space is provided in any of the houses, and, in each instance, the chimney rests upon wooden brackets, thereby causing a fire hazard. The porch of each house, or at least a part of it, should have been properly screened, to allow the residents to occupy it after nightfall under protection against the anophelene mosquito. Other defects will be noted from the foregoing figures, which, however, are of less significance. All of these houses could have been constructed so that their appearances would have been attractive, their interiors more convenient and their many defects eliminated, with very little, if any, increase in cost.

The Tennessee Department of Public Health has developed a bulletin for general distribution, which shows ten modern farm-tenant houses, ranging in size from two to five rooms and in estimated cost of construction from two hundred twenty-five ($225.00) to five hundred fifty ($550.00) dollars. The cover design of the bulletin shows a suggested plan of grouping houses into small communities.

The bulletin shows front views of the houses, floor plans and estimated costs of construction. It also includes details relative to location, the lot, design, bids and erection, and sanitation. The latter includes a detailed description of a properly constructed well and a sanitary privy.

Fig. 3, Top. Fig. 4, Center. Fig. 5, Bottom.

After a selection of location and types of houses has been made by the land-owner, working drawings, bills of material, and general specifications for the houses are available to him through the local health department.

The more important recommendations which are included in the bulletin are as follows:

(1) Proper location of the houses in scientific groups rather than the isolated single dwellings scattered over the plantation in haphazard places.

(2) Underpinning of concrete or other material which will not rot, and ventilation of the space under the floor.

(3) The use of standard lengths and widths of lumber and other materials to facilitate their purchase in a small town and to minimize waste.

(4) Construction of floors of good tongue and groove wood flooring, free from knots. We do not believe that land-owners will spend the additional money for a sub-floor.

(5) Inclusion of a closet in each bedroom, and a pantry arrangement in each kitchen.

(6) Standard sizes of doors and windows for every house.

(7) Screens of sixteen mesh for doors, windows and all other openings.

(8) Finishing of inside walls and ceilings. Sheet rock or a plaster board of any brand can be used. This board is economical, can be sawed to fit perfectly, can be painted, papered or left natural. Tenants cannot use this board for fuel as it is non-inflammable. Other finishing materials are plaster or three-eighths inch ceiling boards.

(9) Each house should be weather-boarded.

(10) Each house should have an economical and substantial roof. Composition roofing can be purchased considerably cheaper than most any type of

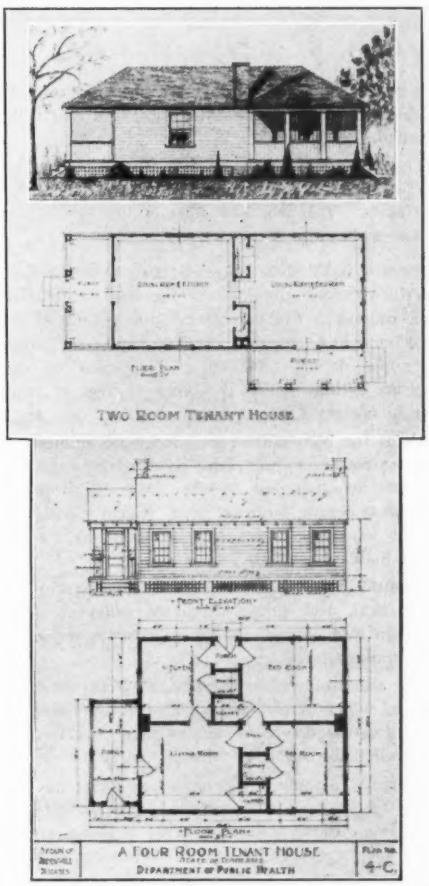

Fig. 6, Top. Fig. 7, Bottom.

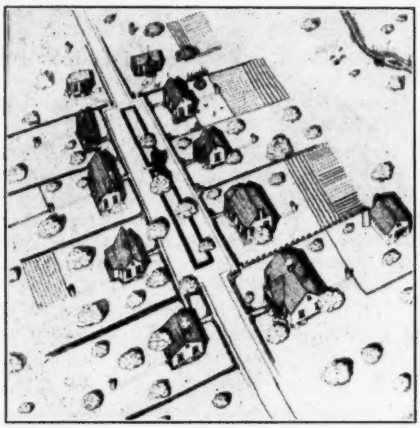

Fig. 8

metal roof and is more resistant to heat and cold. The small additional cost of sheathing the entire roof is well warranted.

(11) Exteriors of all houses should be painted with at least two coats of lead and oil paint or a good wood preservative. This will add years of life to the house and also make it more attractive.

Figures 6 and *7* show houses of two and four rooms respectively which provide the features recommended above, and which can be contructed at estimated costs of two hundred twenty-five ($225.00) and four hundred twenty-five dollars ($425.00). The costs of these houses are entirely within the range of those of houses shown in *Figures 3, 4* and *5*.

Perhaps the best method to insure that a house will be built according to the plans, particularly where local carpenters are employed by the owner, is to provide a bill of materials for each plan, which specifies not only the amount of but also the exact use for each item of building material.

If central water and sewerage disposal systems are not practical, each house should be provided with a safe pump well, located conveniently to the house, and also a sanitary privy.

There are many other features, some of minor importance, which should be included in the construction of a satisfactory farm tenant house, but time will not permit a discussion of them in this paper.

Community planning or grouping of tenant houses is believed to be of equal importance to individual house construction. In the bulletins referred to above, we have stressed the importance of scientific grouping of tenant houses, and Figure 8 shows an aerial perspective which is used on the cover sheet of the bulletin.

In areas where it has been practiced, community planning has been found to be profitable to both tenants and land owners.

For the tenants, an improved water supply, proper sewage disposal and protection against malarial infected mosquitoes can be more easily and economically attained when the tenant-houses are arranged in groups. Thus, community planning promotes a higher standard of hygiene, public health and social welfare. For the land owner, the scientific planning and grouping of his tenant-houses should be of economic value, since it aids in the protection of the health of his employees, thereby increasing their efficiency and productiveness. Grouping also facilitates the inspection of his houses and direction of the work of his tenants. Finally it should create among his tenants a pride in caring for their homes, thereby resulting in a minimum of depreciation of the property.

DISCUSSION (*Abstract*)

Mr. C. C. Kiker, Montgomery, Ala.—The idea of house and community planning is not entirely new, but this paper presents the subject in a new light and describes some very important steps which have been taken in a forward direction. Efforts along this line must surely bear fruit with a reasonable and conscientious public.

Proper home planning and construction drive at the root of much of the difficulty we are now encountering in mosquito proofing rural homes. While it is possible to make a large percentage of the old houses mosquito proof, the task is no easy one.

A significant fact brought out by the paper is that houses of satisfactory construction can be built at very little additional cost over those improperly constructed. This should certainly be of interest to the owner. Were insect-proof houses obtained at considerabe cost both in new and old construction, the outlook would not be favorable. But the additional cost of mosquito proofing in new construction is fractional; and in houses already constructed it appears to be well within reach of the average tenant or owner.

I am glad to know that one state department of health has taken the lead in the publication of plans for construction of rural homes. This has been considered in Alabama, but to date the work has not been undertaken.

Mosquito proofing programs as an activity of a number of county health departments were initiated in Alabama some two years ago. While we have not accomplished all that we hope to in the matter of actual construction, no opportunity has been lost of furthering the educational feature of the program. A marked tendency toward improved construction has been observed. Builders at present appear to be giving more thought to making new houses insect proof. In view of past practice this is encouraging, and in the fact lies hope of securing evertually the most from improved housing in malaria control.

MALARIA CONTROL IN ALABAMA IN 1932*

By J. N. BAKER, M.D.,**
Montgomery, Ala.

Malaria control work in Alabama for the year 1932 has continued along the lines outlined in last year's report. County health departments, aided by a number of field men from the central office, have continued to attack the problem wherever control work appeared feasible. Economic conditions have materially affected actual construction in the form of drainage and screening. Nevertheless the men's time in the field has been utilized to advantage in carrying out educational programs through use of the motion picture films and a total of 32 counties have been reached with programs of this kind.

Early in the year, work and study on a plan for drainage on a county-wide basis was begun and facts and figures are being assembled for future use. There is still a great deal of minor drainage which could be accomplished at relatively little cost. Its handling on a county-wide basis seems preferable. Recent legislation provides for the use of convict labor in the construction or maintenance of projects incorporated under the drainage law.

Control of impounded water remains a major activity. The field work in this connection is being gradually shifted from the central organization to the county health departments. Uniform observation of the regulations governing impounded water has been secured with no known epidemics occurring during 1932. In one instance an outbreak was probably averted by having an owner dewater early in the season and clear the basin before reimpoundage. In another instance, several measures were carried out to combat the possible danger resulting from an early season infestation of *Anopheles quadrimaculatus*. Production was halted by lowering the water level of the pond and increasing larvicidal operations. Transmission along the affected population was prevented by spraying houses daily and administering plasmochin for a period of thirty days. The expense of these measures was borne by the company, which also screened all unscreened houses in the affected areas. This particular project is an old one and is not subject to the regulations, but illustrates the cooperation being secured in preventing malaria transmission around impounded water.

During the year, the director of malaria control on one impounded water project made material improvements in equipment for applying oil as a larvicide, thus reducing costs and increasing the effectiveness of the work.

A motion picture film, dealing with malaria control on impounded water, was completed by the department during the year. It supplies a special need for a film of this type.

Indications are that Alabama this year will have the lowest malaria death and case rate in its history. We cannot claim that this comes as a result solely of our efforts, as seasonal conditions have undoubtedly had much to do with the decrease since the peak occurring in 1929.

The comparative morbidity reports for the state as a whole for the years 1929-1932 from January 1 to November 1 of each year are given as follows:

Year	No. Cases Reported
1929	9496
1930	4397
1931	2219
1932	2004

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Sixth Annual Meeting, Birmingham, Alabama, November 15-18, 1932.

**State Health Officer.

MALARIA CONTROL IN ARKANSAS IN 1932*

By C. W. GARRISON, M.D.,**
Little Rock, Ark.

Arkansas malaria control activities for 1932 comprised measures for mosquito prevention in 24 urban areas, having a combined population of approximately 200,000, a greater increase in control activities in rural areas through mosquito proofing of homes and the administration of quinine. Considerable educational work, together with actual supervisory work, has been carried on throughout the season by the county health personnel. Activities carried on in the urban areas comprised no new methods, although a new type of larvicide as a substitute for oil was tried out in a number of areas. The data available in connection with the use of this larvicide is insufficient to permit of satisfactory conclusions. This larvicide is a by-product in the manufacture of alcohol out of hardwood in Crossett, Arkansas. It is a heavy acid oil that precipitates in water sweeping down the larvae.

During the past six weeks the State Board of Health has cooperated with the state and county committees which administer funds granted by the Government Reconstruction Finance Corporation, and has been successful in promoting minor drainage projects in connection with the unemployment relief activities. It is felt that minor drainage for mosquito prevention is admirably adapted to the R. F. C. relief activities, in that no materials are required and that the need for the drainage is generally found in those more thickly settled rural sections where the problem of unemployment is acute. We are planning to expand our drainage

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**State Health Officer.

activities along with the unemployment relief work and particularly in rural areas. While the amount of money spent on these projects is largely in proportion to the amount of effective drainage secured, it is realized that the primary purpose of these projects is to aid in unemployment.

Owing to financial limitations, it was found necessary greatly to curtail the mosquito proofing program begun in 1931. It is felt, however, that this work is very valuable and should be extended when economic conditions are more favorable.

The total number of malaria deaths reported for 1931 was 499 compared to the previous three-year average of 742, representing a reduction of 33 per cent over the three-year average or a death rate of 27 per 100,000.

MALARIA CONTROL IN GEORGIA IN 1932*

By L. M. CLARKSON,**
Atlanta, Ga.

The year 1932 was the second full year of intensive promotion of urban and rural drainage, principally by the use of county and state convicts for malaria drainage. The latter quarter of the year was marked by adding to convict labor certain forces classified under unemployment relief, city tax delinquents, city prisoners and regular city employees. Approximately 141 miles of new drainage was constructed and approximately 500 miles of maintenance, or old drainage involving lighter work. There were 745 ponds comprising over 4,000 acres drained.

Attention may be called to the considerable increase of rainfall during 1932, yet there was but a slight increase of malaria deaths for this year. Even though there was an excess of rainfall for the year throughout the malarious counties, the malaria deaths remained practically stationary. Because of its short duration, too much credit should not be given to drainage.

An attempt was made during the year in two counties to obtain more accurately information relative to malaria incidence by means of blood examinations in all schools. Immediately after this information was obtained, showing a very high rate of malaria infection, one of these counties readily agreed to cooperate by assigning convicts for use on drainage. Drainage surveys are now in progress and actual construction will immediately follow. It is proposed to use these two counties as demonstration areas to measure results. This work is in cooperation with the Division of Epidemiology.

Several counties have obtained loans from the Reconstruction Finance Corporation and are using unemployed forces for malaria drainage. It is anticipated that during this year work will be considerably augmented and many counties will take advantage of this means of unemployment relief and public health improvement.

CLASSIFICATION OF COUNTIES UNDER MALARIA DRAINAGE

It will be noted that there are 44 counties which have been rendered engineering service by drainage surveys and drainage supervision. Some of these counties have practiced malaria control by the use of county or state convicts for both rural and urban drainage. Others have made use of miscellaneous labor chiefly in towns, but in some instances for both urban and rural drainage.

Below are listed accredited and non-accredited counties. An accredited county is defined as follows: (a) official adoption of malaria control by county commissioners; (b) use of county or state convicts or other labor authorized by county officials; (c) plan intermittent or continuous consistent with agreement of county. A non-accredited county is one which has completed a project or projects without official assurance of continuous work.

Accredited Counties.—Appling, Ben Hill, Burke, Calhoun, Chatham, Colquitt, Decatur, Dodge, Dougherty, Irwin, Laurens, Meriwether, Miller, Mitchell, Montgomery, Richmond, Screven, Sumter, Thomas, Turner, and Worth.

Non-Accredited Counties.—Bacon, Bryan, Bulloch, Candler, Coffee, Crisp, Dooly, Emanuel, Evans, Fulton, Glynn, Jenkins, Johnson, Lee, Liberty, Pulaski, Tattnall, Telfair, Tift, Treutlen, Washington, Ware, and Wheeler.

It is interesting to note that as progress is made in establishing urban and rural drainage authorized by public officials the interest of individual property owners is also so stimulated that service from the Division is requested for malaria and drainage investigations. The fact that a pond, either natural or artificial, usually constitutes a malaria problem is being more generally recognized. This is a considerable aid to official establishment of county drainage.

MALARIA DRAINAGE BY DYNAMITE

A project worthy of mention is a very serious malaria problem in a valley 25 miles north of Atlanta. The problem involves several hundred families in an excellent agricultural territory. It is no exaggeration to state that the malaria problem has been so serious that families have moved from the county on account of it. The problem involves a drainage project of exceptional magnitude. After three years of effort by the Division, the project was recently started. Portions of the drainageway have been improved by the use of dynamite. It is proposed during the current year to continue the work, gradually completing the entire project.

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**Chief Engineer, Division of Sanitary Engineering, State Board of Health.

CONTROL OF IMPOUNDED WATERS

Under a permit system, all water impounded in the State must meet requirements for protection of the public from malaria caused by impounding of waters for hydro-electric, water power, recreational and fishing purposes. The proposed area must first be cleared of all vegetation and if in the malarious section of the State an approved larvicide, together with approved equipment for applying it, must meet specifications of the Department of Public Health. Any person, firm, corporation, county or municipality desiring to impound water must first submit plans and a description of the project. The proposed site is then investigated by a representative of the Division. If approved, a preliminary permit is granted to proceed with construction. This area then is under constant observation until satisfactory work justifies raising of the water. When clearing, larvicide application and equipment is satisfactory, a final maintenance permit is issued. Below is data showing the extent of impounded water malaria control:

HYDRO-ELECTRIC IMPOUNDED WATER MALARIA CONTROL

Number of hydro-electric developments meeting impounded water regulations	38
Number of acres in hydro-electric areas	150,000
Number of hydro-electric developments using larvicides for mosquito control	7
Number of acres under larvicide control	21,000

MALARIA CONTROL IN FLORIDA IN 1932*

By HENRY HANSON, M.D.,**
Jacksonville, Fla.

The malaria control activities in Florida have consisted of a continuation of an educational program, stressing the importance of protection against the Anopheles by screening and by this we mean mosquito proofing of the houses. Short radius drainage as well as other practical drainage projects have been advocated and established. There has recently been an arrangement made by which some of the Reconstruction Finance Corporation funds have been made available for ditching in areas selected by the State Board of Health.

During the summer a general survey of the southern portion of the state was made by Drs. Mark F. Boyd and T. H. D. Griffitts, Mr. G. H. Bradley, in charge of the Entomological Station at Orlando, Mr. Louva G. Lenert, the Chief Engineer of the State Board of Health, and the State Health Officer. This tour included observations beginning in Hillsboro County and from there on southward along the west coast as far as Fort Myers, thence to the southern tip of the peninsula and across along the Tamiami Trail and from Miami as far south as Long Key. *Anopheles quadrimaculatus* were found as far as the Tamiami Trail. Crucians were found as far south as Homestead. Beyond that point no Anopheles were observed. The district sanitary officers have made such surveys of Anopheles prevalence as their duties would allow, giving a partial distribution of breeding.

Among the special activities we have the Rockefeller Foundation which is maintaining a station of Malaria Research at Tallahassee working, under the direction of Dr. Mark F. Boyd, largely on the rearing of Anopheles in a specially prepared insectary and the inoculation of paretics with benign tertian malaria at the Hospital for the Insane at Chattahoochee. Much valuable new data have been made available at this Station. For other details reference is made to the publications of Drs. Mark F. Boyd and W. K. Stratman-Thomas.

Supplementing the work of the Malaria Research Station at Tallahassee the Surgeon General has detailed Dr. T. H. D. Griffitts to carry on field studies in malaria control. Dr. Griffitts has his office at the headquarters of the State Board of Health and has embarked on a program of surveys with the plan of selecting two counties for special control studies. Dr. Griffitts is in charge of the Division of Malaria Control Studies of the State Board of Health.

Recently an arrangement has been made with the Bureau of Entomology by which Dr. W. V. King has been placed on our staff as consultant in Entomology.

The work in all three divisions is, as may be judged from the character of the personnel in charge, of the highest character and we expect to develop a program of malaria control on the basis of the findings of the three experts in question. The work of the Malaria Research Division, under Dr. Boyd's immediate direction, is the first established and has its program more developed than the others.

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Sixth Annual Meeting, Birmingham, Alabama, November 15-18, 1932.

**State Health Officer.

MALARIA CONTROL IN LOUISIANA IN 1932*

By W. T. BROWNE, M.D.,**
New Orleans, La.

With our shortage of funds and the different small flurries of smallpox, *et cetera*, we were very fortunate in being able to show the following figures:

There has been a slight increase in the number of cases of malaria reported in the State of Louisiana.

1930	1931	1932
1096	652	960

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**Director, Bureau Malaria-Mosquito Control, State Board of Health.

The figures for house screening are 1,594 for the year of 1932.

The number of examinations made of blood for malaria parasites is 7,468.

There were 159 deaths from malaria fever in 1932.

The Welfare Association for the unemployed has put to work several thousand men cutting weeds and grass along the highways, and we have been able to get these men to open drainage and establish a flow of water as they go along the road.

Our experiment with chinoplasm which was reported in our last symposium has proven a success as not a single case has been reported from the neighborhood of our experiment up to the present time.

Drainage and ditching work is now being done in the state, new ditches being built, ditches opened, cleaned, scraped and oiled, and certain lands are being treated with larvicide.

Special surveys have been made in a number of northern Louisiana parishes.

At present we are draining and building new ditches all through Grand Isle with excellent results.

MALARIA CONTROL IN MISSOURI IN 1932*

By W. Scott Johnson,**
Jefferson City, Mo.

I regret to advise that early in 1932 the malaria program in southeast Missouri was abandoned due to lack of funds, and consequently there is no report to be made on this activity.

In cooperation with the Union Electric Company, owners, the control program on the Lake of the Ozarks was continued on much the same basis during the 1932 season, with substantial improvements however. The results of this control work around the lake have been very satisfactory and we believe as far as the shore line of the lake is concerned the work has proven effective in the control of mosquito breeding. However, due to lack of activity on the part of local authorities, there has been notable mosquito breeding above the high water level of the lake in the small, tributary streams. And, at least in one county a number of malaria cases developed from this source. It would seem that unless the local communities take a more active interest in the mosquito breeding problem in the water courses above the high water level of the lake, a great deal of the effectiveness of the control work on the lake will be nullified.

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**Chief Public Health Engineer, State Board of Health.

MALARIA CONTROL IN MISSISSIPPI IN 1932*

By George E. Riley, M.D.,**
Jackson, Miss.

With three engineers employed during the six months period, January 1 to June 30, 1932, and only two engineers employed for the period July 1 to September 30, 1932, there were 106.8 miles of surveys made as compared with 145.6 miles surveyed during the twelve months period January to December, 1931, when three engineers were employed throughout the entire period. There were 72.0 miles of surveys put to grade during the nine months period as compared with 46.0 miles during the period January 1 to December 31, 1931. There were 5662.0 acres of land reclaimed as a result of the drainage work completed. The tax assessors of the respective counties estimated that the assessed value of the land affected had increased on an average of $20.00 per acre.

A bulletin "The Screening and Mosquito-Proofing of Houses" was prepared by the director of the division of malaria control. This bulletin had for its object the enlistment of the cooperation of the division of vocational education of the department of education of the state. This agency has been very cooperative in promoting screening projects in 194 Vocational Agricultural Schools, including 154 Trade and Industrial Schools.

Screening and minor drainage with special reference to control of anopheline mosquitoes have been a part of the routine activities of the 29 full-time health departments.

During the nine months period there were reported to the department the complete screening of 322 houses and the installation of 437 standard screen doors. An effort is being made to obtain reports from the vocational schools to determine the results obtained through these agencies with special reference to screening activities.

MALARIA CONTROL IN TENNESSEE, JULY 1, 1931-JUNE 30, 1932*

By E. L. Bishop, M.D.,†
Nashville, Tenn.

General.—The program of malaria control in Tennessee for the fiscal year ending June 30, 1932, was continued along lines previously employed, and certain additional activities were inaugurated by reason of the employment of additional personnel, which included a

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**Director, Division of Malaria Control, State Board of Health.

†State Commissioner of Health.

malariologist, an assistant sanitary engineer, and a malaria microscopist. The continued cooperation of the U. S. Public Health Service and Vanderbilt University is gratefully acknowledged.

Efforts of the malariologist have been directed particularly to the development of local programs of malaria control, the stimulation of more complete reporting of cases of malaria by practicing physicians and instructions of health officers and other physicians in the microscopical diagnosis of the disease.

Screening and Mosquito-Proofing.—Early in June, 1932, a three-day screening school for health officers and sanitary inspectors was conducted in Shelby County in cooperation with the Shelby County Health Department. Thirty-seven persons registered for the course.

Major screening and mosquito-proofing activities were carried on in Shelby and Lake Counties.

Drainage.—County-wide drainage was attempted only in Shelby County. This work has been made possible through funds committed to unemployment relief in Memphis and Shelby County, and supplemented by penal labor. Approximately 24 miles of new ditches were constructed, and 16.5 miles of old ditches cleared and maintained. Engineering consultation was given by the State Department of Health.

Minor drainage was promoted extensively in Dyer, Lake, Obion and Lauderdale Counties. An assistant sanitary engineer was employed exclusively in this work, and the projects were developed largely from the point of view of land reclamation.

Roadside barrow pit drainage was continued, on state and county highways, as cooperative projects between the Health Department and the Highway Department of the state. The State Health Department assumed the duty of locating the barrow pits needing drainage, and the division of maintenance of the State Highway Department assumed the responsibility for actual drainage.

Impounded Water Control.—Consultation service to owners of impounded water projects has been continued, and during the year, mosquito control has been affected through the use of oiling of shore lines by means of power boats and through controlling the water level by use of head gates.

Municipal Mosquito Control.—Municipal mosquito control which included drainage, the use of larvacides, premise inspection and screening has been carried out in 25 cities and towns, principally in West Tennessee.

Some experiments in mosquito control in lily ponds have been carried out in Memphis, using a mixture of pyrethrum extracted in kerosene and emulsified in soap solution.

Housing Improvement Program.—The difficulty of mosquito-proofing a large proportion of the types of rural tenant homes found in the South is well known. Efforts have been made during the year to develop plans whereby the state and local health departments could assist landowners not only in the construction of better homes for tenants, but also in the scientific grouping of these homes and the selection of building sites with a view to eliminating malaria hazards. Architectural plans, together with bills of materials for a variety of homes have been prepared with a view to the development of a bulletin which will be distributed to landowners through the local health department.

MALARIA CONTROL IN VIRGINIA IN 1932*

By G. FOARD MCGINNES, M.D.,**
Richmond, Va.

There has been a constant and rather rapid decrease in malaria incidence in Virginia during the past ten years. Very little work has been done by the State Health Department in the control of this disease recently as it is no longer one of the major problems. Every effort is made to obtain complete and accurate reporting of malaria and any increase in prevalence of this disease in any community is investigated. During the past year no such increases have occurred.

Experimental work in mosquito control has been carried on during the past year by the Bureau of Epidemiology in cooperation with the United States Public Health Service. This experimental work has been carried on with the hope of obtaining an effective and economical larvacide which may be used in the control of both the pest mosquito and the anopheline mosquito. Some local communities have carried on local mosquito control programs directed toward elimination of the pest mosquito.

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*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Sixth Annual Meeting, Birmingham, Alabama, November 15-18, 1932.

**Epidemiologist, State Department of Health.

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EDITORIAL DEPARTMENT

SOUTHERN MEDICAL ASSOCIATION
Twenty-Seventh Annual Meeting
Richmond, Virginia, November 14-17, 1933

MALARIA

The symposium on malaria in this issue of the JOURNAL reflects the trend of malaria control. Probably at no period since malaria control measures were initiated has there been such an intensification of drainage activities as is now witnessed. This is, in part, attributed to the growing conviction among those interested in malaria control that a dollar spent for drainage gives a better return than a dollar spent in any other manner. It is also attributable to the development of successful procedures for the promotion and extension of drainage, particularly that of a minor character, represented by the programs of the State Boards of Health of Georgia and Mississippi described in this issue. A further impetus to these activities in many sections has come through the employment of labor paid from Reconstruction Finance Corporation funds in drainage operations. While undoubtedly the rapid and unexpected manner in which R. F. C. funds were made available has resulted in the execution of some ill advised or poorly executed drainage, undoubtedly the test of time will show a great deal of permanent benefit.

Mosquito proofing of houses continues to hold the attention of public health workers as the most practical complementary measure. It is interesting to note that thoughtful students of this question realize that it is basically a phase of the housing problem. The housing conditions of a large part of our rural population are unsatisfactory. The studies conducted in Tennessee indicate that improvement in housing does not necessarily mean the requirement of more expensive housing. Too often tenant houses are unwisely situated in proximity to anopheline breeding areas, and their scattering over large plantations frequently prevents the application of antimosquito measures. It is to be hoped that the results of these studies conducted in Tennessee will command widespread attention and extensive adoption.

Despite the difficulties presented by the times, it is most encouraging to see the attention being given malaria control. This strengthens the conviction that with improvements in economic conditions we will witness the greater application of these two most practical measures.

LACTATION IN MALE AND FEMALE ANIMALS

Among breeds of cattle there are "good milkers" and poor. Jersey cows give milk rich in cream, Holsteins a greater abundance of thin milk. Stout, florid women are sometimes apparently unable to nourish their babies, while thin women of anemic appearance may produce enough milk for several infants. For years very little light could be thrown upon the reasons for the difference. Practically nothing was known about the cause of mammary activity, and it was necessary to teach medical students that there were no drugs which directly stimulated milk production. Certain ovarian and pituitary extracts have recently been isolated which specifically stimulate or depress the activity of the mammary glands of several species of animals, both male and female.

The mechanics of lactation in females are somewhat as follows: there is one stimulus, a hormone, which prepares the breast, and a second which initiates milk secretion. Milk production normally begins a few days after the termination of pregnancy, if all the placenta is detached from the uterus. The placenta, source of numerous hormones, is antagonistic to lactation, which fails to occur after delivery until all fragments of the placenta are expelled.[1] If theelin injections (theelin is the crystalline form of the heat-inducing hormone)

1. Smith, George van S.; and Smith, O. Watkins: The Inhibition of Lactation in Rabbits with Large Amounts of Oestrin. Amer. Jour. Physiol., 103:356, Feb., 1933.

are begun immediately after a normal delivery, again lactation is suppressed. Theelin before delivery prepares the mammary glands for a subsequent stimulus to lactation, but theelin immediately after delivery prevents lactation. Fragments of placenta which remain in the uterus after delivery inhibit lactation, possibly through their theelin content.

From studies of Corner, Nelson and Pfiffner, and others, a specific lactation hormone which initiates or increases milk production is secreted by the anterior pituitary gland. Lactation is induced in virgin female animals by injections of this hormone. A more outstanding feat and conclusive proof of the specificity of the hormone action lies in the fact, indicated by Steinach and others, that male animals may be induced to lactate freely by laboratory means. Lactation of males has been reported by Nelson and Smelser,[2] of the University of Chicago, after the following technic:

Adult male guinea pigs were castrated or made cryptorchid and an ovary was transplanted under the kidney or testicle. The nipple of the male animal, which is normally very small, about 2 to 3 millimeters in height, rapidly elongated until it measured from 4 to 15 millimeters. The height of the nipple could be taken as an index of the activity of the ovarian graft; when the graft began to degenerate, the nipple regressed in size. After the male nipples had been stimulated to the increased height, but were still quite dry, injections of anterior pituitary lobe extract were given, 0.5 to 1 c. c. twice daily for varying periods. Milk usually appeared 36 to 70 hours following the beginning of treatment. Milk secretion was preceded by a short period of colostrum secretion. Lactation of males could be induced without ovarian grafts, if a period of theelin injections preceded the anterior pituitary treatment. The two hormones, theelin to prepare the breast, and anterior pituitary lactation hormone to stimulate actual milk production, used consecutively, induced abundant milk flow in male animals. The corpus luteum was unnecessary.

Nelson and Smelser reported upon the psychic effects of lactation in the male. According to Steinach, lactation in male animals is accompanied by the development of maternal instinct with a desire to suckle and care for the young.[2] The Chicago workers report, on the contrary, no effect upon the masculine psyche of their lactating guinea pigs. Young animals in the pens with the copiously lactating males made repeated and vigorous efforts to suckle, but were consistently repelled. The male guinea pigs could be nursed only when held, and they exhibited not even passive resignation after several days of enforced suckling.

Male lactation may thus be induced without great difficulty. The technic in brief is as follows: the male animal is castrated or rendered cryptorchid and a series of theelin injections are given, followed by a series of anterior pituitary extract.

If physiologists continue their progress in breaking down and reassembling the machinery of reproduction, women may yet surrender to the stronger sex the future of the race.

2. Nelson, Warren O.; and Smelser, George K.: Studies on the Physiology of Lactation. Lactation in the Male Guinea Pig and Its Bearing on the Corpus Luteum Problem. Idem., p. 374.

GLEANINGS FROM RECENT JOURNALS

Arsphenamine and Tryparsamide.—In the current interest in the malaria treatment and the various fever treatments of syphilis of the central nervous system, tryparsamide has tended to be relegated to the background of the literature. In a comparative series of cases of general paresis treated by malaria and by tryparsamide, however, the tryparsamide group showed a greater percentage of improvement.[1]

The activity of tryparsamide is quite different from that of arsphenamine. Arsphenamine was developed from experiments upon the early stages of syphilis. It is a potent spirillicidal drug *in vivo*. Treponema disappear from skin lesions within twenty-four hours after arsphenamine injection, rendering the patient non-infectious.[2] Arsphenamine has a marked therapeutic effect in the early stages of syphilis, but very little activity against syphilis of the central nervous system. Tryparsamide was developed as a trypanocidal agent, and has little effect upon early syphilis, but markedly benefits syphilis of the central nervous system.[3]

In seeking an explanation for the different effects of the two arsenic compounds, Solomon, Epstein and Birk,[3] of the Boston Psychopathic Hospital, have compared their respective activities in sodoku, or rat bite fever. Arsphenamine,

1. Hinsie, J. E.; and Blalock, J. R.: Treatment of General Paresis. Amer. Jour. Psychiat., 11:541, 1931.
Ed., Sou. Med. Jour., Treatment of Neurosyphilis. 25:316, 1932.

2. Stokes, John H.: Modern Clinical Syphilology. Philadelphia and London: W. B. Saunders Co., 1926.

3. Solomon, H. C.; Epstein, S. H.; and Birk, A.: Differential Effects of Arsphenamine and Tryparsamide. Amer. Jour. Syph., 17:45, Jan., 1933.

they say, cures sodoku by destroying the spirochetes which cause it. Arsphenamine is destructive to spirochetes, plasmodia and trypanosomes. Tryparsamide, on the contrary, stimulates healing of the local lesion of rat bite fever, but has no lethal effect against the organisms. It does not cure the disease. They suggest that in syphilis of the central nervous system, similarly, tryparsamide may act to stimulate local healing of the lesions of the nervous tissue, without injuring the infecting agent.

Diabetes and Crystalline Insulin.—The purer the drug, usually, the more predictable are its effects. One would expect crystalline preparations to be most desirable from a therapeutic standpoint. Thyroxin, which was crystallized in 1915, however, has not supplanted the use of desiccated thyroid preparations.

Crystalline insulin was obtained by John J. Abel, of the Johns Hopkins University, in 1926,[4] but has been little employed clinically, possibly on account of the expense of preparation. Theelin, crystalline product from the ovarian follicle, was isolated later, and has been rather extensively used in experimental clinical studies. A crystalline male hormone has been reported, and crystalline epinephrine has long been employed. Other hormones in medical and experimental usage are not available in a pure state. There is always the possibility that a highly purified preparation will not have the same clinical effects as one which contains impurities. Howard and de Lawder,[4] of Johns Hopkins, have employed crystalline insulin in four diabetic patients whose carbohydrate tolerance had been carefully estimated. During treatment, a slight increase in the ability to utilize carbohydrates was noted, such as is expected with the ordinary commercial preparations. They conclude that crystalline insulin has the same effects as the preparations in general use.

Arthritis.—Arthritis is an ancient disease and its incidence is variously estimated. Key,[5] of St. Louis, at a recent meeting of the Southern Medical Association, said:

"Hypertrophic arthritis I consider almost physiological in the heavy type of individual past middle life. I do not pay much attention to hypertrophic changes in the roentgenogram of the spine unless the patient is having symptoms. I imagine that hypertrophic changes are present in 50 per cent of the persons in this room."

4. Howard, John Eager; and de Lawder, Agnes: Crystalline Insulin in the Treatment of Diabetes Mellitus. Bull. Johns Hop. Hosp., 52:173, March, 1933.

5. Key, J. Albert: Discussion of paper of Shands and Oates, Infectious and Hypertrophic Arthritis of the Spine. Sou. Med. Jour., this issue, p. 384.

TWENTY-FIVE YEARS AGO

Uremia and Subtemporal Decompression.—Harvey Cushing and James Bordley, Jr., of Baltimore (*Amer. Jour. Med. Sci.*, 136:484, 1908), report a case of subtemporal decompression in chronic nephritis with uremia. The operation was followed by marked improvement. The result supports the hypothesis that cerebral symptoms in the so-called state of uremia are largely due to pressure from edema of the cerebral tissue. The case suggests the propriety of permanent decompression in selected instances of renal disease which medical measures or lumbar puncture have failed to relieve.

Keratin in Tabes.—S. M. Zypkin (*J. A. M. A.*, 50:57, 1908), has been applying keratin in the treatment of tabes, chronic myelitis and disseminated sclerosis with such good results that he recently applied it in a case of cirrhosis of the liver. . . . . After 14 months of the keratin treatment the patient was restored to comparative health. . . . . Zypkin is inclined to ascribe the benefit to the glutin binding capacity of the keratin, or to some direct action on the parenchymatous elements of the nervous system.

Medical Education, 1908.—(J.A.M.A., 50: 287, 1908). Under provisions of a resolution adopted December 31 by the Trustees of Grady Hospital, Atlanta, medical students from all colleges of Atlanta will be permitted to visit the charity wards of the hospital for bedside teaching.

(Idem., p. 288). Under an agreement reached more than two months ago, the merger of the Louisville College of Medicine and the Hospital College of Medicine became effective January 1, under the name of the Louisville and Hospital Medical College, Medical Department of the Central University of Kentucky.

Dr. William H. Welch, of Baltimore, in an address at the convocation exercises of the University of Chicago, said (*J.A.M.A.*, 50:1, 1908):

"Most gratifying is the rapidity with which medical education has risen in the last two decades from the low estate to which it had sunk during the greater part of the past century in this country. . . . . We may . . . assume with confidence that the best and in time the prevailing type of American medical school is destined to be that represented in medical departments in vital union with universities. . . . . There is even some risk [owing to the rapid increase in laboratory facilities in the medical schools] that a subject which can be studied with facility and advantage in a laboratory may acquire, on this account, a position in the scheme of medical studies disproportionate to its relative importance. . . . . The time has come to give spe-

cial emphasis to directions of improvement in the teaching of practical medicine and surgery. . . . . It would be one of the greatest benefits to the cause of higher education if the University of Chicago for its medical department should come into possession of a good general hospital, and fortunate the hospital which enters into this relationship."

Book Reviews

Clinical Diagnosis, Physical and Differential. By Neuton S. Stern, A.B., M.D. (Harvard), Associate Professor of Medicine, University of Tennessee School of Medicine, Memphis. 364 pages. New York: The Macmillan Company, 1933. Cloth, $3.50.

The didactic teaching of diagnostic procedure is presented at length in the first three sections of this book. Due importance is given to the taking of a complete history. For better understanding, several histories are written out and then synthetized to show the essential points. The signs and symptoms of tuberculosis and heart disease are accorded a special section. The classification of the American Heart Association is used. There is no discussion of hypotension, which is now considered by some a clinical entity.

The inclusion of a number of cases for diagnostic practice is a waste of space, as any teaching institution should be able to provide actual patients for student instruction.

The fourth section is a departure from the usual in texts of physical diagnosis. In this part symptoms and signs, their mechanism and the diseases which employ these mechanisms are discussed. A careful study by the student of these discussions will enable him to approach the problem with a clearer concept of the possibilities. The lack of illustrations detracts from the book. The author is to be commended on presenting an old subject in a different manner.

Varicose Veins and Haemorrhoids and Their Treatment. By V. Meisen, M.D., Former Chief Surgeon to the Policlinic, Sundry Hospital, Copenhagen. With a Preface by Aug. Krogh, Ph.D. 149 pages with 25 figures and 8 colored plates. New York and London: Oxford University Press, 1932.

This monograph is a valuable resume to the literature of varicosities that has been appearing in recent years. It represents the accumulated experience of the writer derived from a study of 3,500 cases, all of which are drawn from a different field from that which has been covered before. In addition, a large number of foreign writings are reviewed which are somewhat difficult of access in this country.

The first chapter is on the descriptive anatomy of the venous system of the lower extremities; and the second is concerned with the physiology. Both are well written and illustrated. Eighty pages are devoted to a discussion of varicose veins, complications and sequelae, stasis of infrequent origin, treatment of varicose veins and other lesions. From experiments and clinical observations the author concludes that the effect of the treatment is derived from a hypertonia of the venous wall and the injected drug is non-toxic up to 10 c. c. The solution used is composed of 25 per cent sodium salicylate and 10 per cent sodium chloride in equal parts. This the author uses in most of his cases. It has been called the Meisen mixture.

The injection treatment has been used in the treatment of varicocele, venous angioma and once in hydrocele, all of which had good postoperative results.

The final chapter describes the injection treatment of hemorrhoids. Practically the same principles are involved. The preferable solution in Meisen's hands is 50 per cent glucose. The advantages of the injection method over the operative are advanced, but conservatism is shown in the method of selecting the cases for treatment.

Chapters in American Obstetrics. By Herbert Thoms, M.D., Associate Professor of Obstetrics and Gynecology, Yale University School of Medicine. 90 pages. Springfield, Illinois: Charles C. Thomas, publisher, 1933. Cloth, $2.00.

In selecting outstanding American obstetricians for brief biographical sketches, Thoms has described the high points of American obstetrics and has given a readable and valuable history of the subject. The first chapter deals with the beginnings of obstetrics in America. Subsequently the men chosen for separate sketches are Samuel Bard, John Stearns, William Potts Dewees, Oliver Wendell Holmes, Marmaduke Wright, and Walter Channing.

The Action of the Living Cell. By Fenton B. Turck, M.D. 305 pages. New York: The Macmillan Company, 1933. Cloth, $3.50.

The author deals with the cytost theory of shock, aging and the degenerative diseases. He postulates a single specific substance, cytost, the chemical nature of which he discusses. Cytost is liberated upon injury to any living cell and is the cause of a large number of subsequent changes in the organism. The author displays a one-sided viewpoint of biology.

Your Hearing: How to Preserve and Aid it. By Wendell Christopher Phillips, M.D., Consulting Surgeon, Manhattan Eye, Ear and Throat Hospital, New York City, and Hugh Grant Rowell, M.D., Assistant Professor of Health Education and Physician to the Horace Mann Schools, Teachers College, Columbia University. 232 pages. Cloth, $2.00.

This small volume for the laity describes methods of testing the hearing and differentiating different types of deafness. Preventive measures are also given. It is illustrated with charts and pictures of instruments in use.

The Rockefeller Foundation. Annual Report, 1931. 420 pages. New York: The Rockefeller Foundation.

The work of the Foundation for the year is summarized in this report. Progress has been made in the research on yellow fever, a monkey (*Macacus rhesus*) has been inoculated in the laboratory and the first human has been vaccinated against this disease. References are given to all the papers published by members of the Foundation during the year. The usual financial report is included.

BOOK REVIEWS continued on page 479

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*Deceased.

BOOK REVIEWS continued from page 477

Diagnosis and Treatment of Diseases of the Thyroid Gland. By George Crile and Associates. 508 pages with 164 illustrations. Philadelphia and London: W. B. Saunders Company, 1932. Cloth, $6.50.

This book is a compilation of 39 articles, each article making a chapter, one or more of which have been written by each of 22 authors selected from the Staff of the Cleveland Clinic. Each chapter deals with one of the various phases of thyroid disease. It contains a comprehensive review of the literature as well as the author's own experience and ideas. The many problems of thyroid disease are approached from various angles. The book should be of interest to the physiologist, the pathologist, the internist, the surgeon, the obstetrician, the research worker, and the public health officer.

Pituitary Body, Hypothalamus and Parasympathetic Nervous System. By Harvey Cushing, Professor of Surgery (Emeritus), Harvard University, and Recently Surgeon-in-Chief, Peter Bent Brigham Hospital, Boston. 234 pages, illustrated. Springfield, Illinois: Charles C. Thomas, publisher, 1932. Cloth, $5.00.

Four separate lectures delivered by Cushing in 1930, 1931 and 1932 are included, approximately without changes. The subjects are neurohypophysial mechanisms from a clinical standpoint; posterior pituitary hormone and parasympathetic apparatus; the basophil adenomas of the pituitary body and their clinical manifestations (pituitary basophilism); and peptic ulcer and the interbrain.

Cushing's place in the literature of brain disease and its relation to the body as a whole is well known. His early studies of acromegaly and more recently of pituitary basophilism are of greatest significance. These lectures are not so difficult as their titles would indicate, and they are worthy the attention of any physician.

Calcium Metabolism and Calcium Therapy. By Abraham Cantarow, M.D., Instructor in Medicine, Jefferson Medical College. With a Foreword by Hobart Amory Hare, B.Sc., M.D., LL.D., Late Professor of Therapeutics, Materia Medica and Diagnosis in the Jefferson Medical College, Philadelphia. Second edition, thoroughly revised. 252 pages. Philadelphia: Lea & Febiger, 1933. Limp binding, $2.50 net.

An excellent monograph upon a much studied subject. Normal calcium requirements, excretion, blood calcium, occupy more than a third of the book, which deals also with conditions of abnormal calcium metabolism and with conditions in which calcium therapy is employed. The modern studies upon the parathyroids are fully covered. Dental caries is included. A prodigious biochemical literature has been most ably and judiciously reviewed, and the subject has been greatly clarified for clinicians.

The Tides of Life. The Endocrine Glands in Bodily Adjustment. By R. G. Hoskins, Ph.D., M.D., Director of Research, Memorial Foundation for Neuro-Endocrine Research, Research Associate in Physiology, Harvard Medical School. 352 pages, illustrated. New York: W. W. Norton & Co., 1933. Cloth, $3.50.

Hoskins has a gift for popularizing abstruse material, and he has done a great deal to arouse clinical interest in endocrinology. His exaggerations are much less than one would expect from such an enthusiast as he undoubtedly is for his subject. His style is stimulating and he has reviewed the important literature adequately and without making extreme deductions. He is writing apparently for the laity, since he translates such words as glycosuria. But since in this day the majority of physicians are laity to the physiologist, clinicians as well as laymen will derive instruction and pleasure from reading his work.

The Organs of Internal Secretion: Their Diseases and Therapeutic Application. With a Chapter on Obesity and Its Treatment. By Ivo Geikie Cobb, M.D., M.R.C.S. Fourth Edition. 303 pages. Baltimore: William Wood & Co., 1933. Cloth, $3.50.

This book is not up to date or discriminating in its review of the literature. The suprarenal cortex is dealt with in somewhat more than a page. The work of F. A. Hartman and Rogoff and Stewart is mentioned. Preparations of doubtful value receive most attention. The book is listed merely to spare the reader the trouble of considering it.

The Failing Heart of Middle Life. By Albert S. Hyman, A.B., M.D., F.A.C.P., Cardiologist, Beth David and Manhattan General Hospitals, New York, N. Y., and Aaron E. Parsonnet, M.D., C.M., F.A.C.P., Attending Physician and Cardiologist, Newark Beth Israel Hospital, Newark, N. Y. With a Preface by David Riesman, M.D., Sc.D., F.A.C.P., Professor of Clinical Medicine, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania. 538 pages with 166 illustrations, some in colors. Philadelphia: F. A. Davis Company, 1932.

This book deals with the general subject of cardiac disease dependent on coronary arteriosclerosis with the consequent myocardial disability. The first section is concerned with the anatomy, physiology and pathology of the coronary arteries. The subject is well covered and there are many excellent photographs.

The second portion of the book is entitled "The Myocardiosis Syndrome." The authors' objection to the term "chronic myocarditis" is justifiable and for it they substitute the name "myocardosis." Otherwise this section contains little that is not already well known and in several instances a lack of critique is displayed, as for example in what seems to the reviewer a too ready acceptance of the value of the various "functional tests" for the heart.

The third section of the book deals with coronary thrombosis and this in general is sound and well written, although there is very little information which cannot be found in Levine's monograph on the same subject.

The fourth portion of the book is concerned with electrocardiography and presents a detailed discussion of this phase of the subject. Although here again original observations on the subject are lacking, this portion of the book is worth reading.

There follows a detailed discussion of angina pectoris and this is considerably better than that usually encountered in books on the heart. The last part of the book is concerned with "the medico-legal aspects of sudden death from heart disease." This is a subject of considerable importance and is well covered. This por-

tion of the book contains information which cannot be found in other volumes and it may therefore be considered as the most valuable contribution which the authors have made.

In summary, "The Failing Heart of Middle Life" is an adequate and in the main an accurate presentation of modern conceptions of the subject. It is therefore a useful book for physicians who are not already well trained in the diagnosis and treatment of cardiac disorders. On the other hand since, aside from the last section, it contains relatively little new information, it cannot be recommended to physicians who already have a fairly comprehensive knowledge of cardiac disease.

Excitability: A Cardiac Study. By W. Burridge, D.M., M.A., Oxon, Professor of Physiology, Lucknow University. 208 pages. New York and London: Oxford University Press, 1932. Cloth, $3.85.

The author has been studying the isolated mammalian and reptilian heart for many years. He has arrived at conclusions which are quite different in many respects from the usually accepted ones concerning the nature of excitability and contractility. Beginning with a discussion of Ringer's solution, the author proceeds to a consideration of the role of inorganic salts in cardiac physiology. Discussions of inhibition, chronaxie, rhymicity, refractoriness and fatigue follow. Whether or not the author's conclusions are justified, the reviewer is not qualified to state. In any case they are too important to be dismissed simply because they are contrary to accepted points of view.

A New Physiology of Sensation, Based on a Study of Cardiac Action. By W. Burridge, D.M., M.A., Professor of Physiology, Lucknow University. 65 pages. New York and London: Oxford University Press, 1932. Cloth, $1.50.

In this little volume the author has applied his physiological conceptions derived from the study of the heart to the nervous system and especially to the subject of sensation. The chief objection to the book is that it is concerned largely with speculation rather than with experiment, and the author appears to have been uncritical in making far-reaching deductions. Whether or not his conclusions are correct, his ideas are of interest, and if further experience proves them to be correct, this little book may become a landmark in the history of physiology.

Medical Entomology. By Robert Matheson, Ph.D., Professor of Entomology, New York State College of Agriculture, Cornell University. 489 pages, illustrated. Springfield, Illinois: Charles C. Thomas, publisher, 1932. Cloth, $5.00.

Dr. Matheson warns the reader that even though this is only an introductory text to the study of arthropods and their relation to human disease, there are many places in which the information is still incomplete. Rapid strides have been made in this branch of science during the past forty years. Still many problems confront the worker. The first chapter gives a short historical account of this field; the last chapter describes methods of collecting, preserving and identifying the specimens which may be collected. Eighteen chapters are devoted to the various arthropoda that are vectors in human disease. No reference is made to the treatment of the conditions which may be encountered, the author limiting his discussion to the identification of the insect, its life history, the disease for which it is responsible and methods of controlling the insect. The practitioner will find the subject well worth while and may even develop a "flare" for entomology by following the extensive bibliography at the end of each chapter.

Food in Health and Disease: Preparation, Physiological Action and Therapeutic Value. By Katherine Mitchell Thoma, B.A., Director of Dietetics, Michael Reese Hospital, Chicago. 370 pages. Philadelphia: F. A. Davis Company, 1933. Cloth, $2.75.

The first part of this book covers the composition of foods and their use in the dietary, digestion and metabolism, the adequate diet for adults and children. The second part gives the standard diet that is adopted in the hospital and the variations used in disease. These diets are discussed from the viewpoint that there is only one diet, the general diet; and that all other diets are modifications of it, supplying special needs. Parts three and four are laboratory exercises for practical instruction. At the end of each chapter are a number of review questions. The subject matter is adequate for the training of nurses and for a basic dietary knowledge for the physician.

The Medical Secretary. By Minnie Genevieve Morse, Member Board of Registration, Association of Record Librarians of North America. 162 pages. New York: The Macmillan Company, 1933. Cloth, $1.50.

This book covers the qualifications for medical secretarial work, including medical terminology, correspondence, bills and reports; medical indexing, filing, medical research and the proper method of preparing manuscripts for publication. It also deals with the personality of the secretary, the handling of patients and the management of the office in detail.

It should prove helpful to the secretary lacking medical training who assumes the duties of assistant to a physician. Also, the book is invaluable to the nurse who has had no previous secretarial work and expects to take a position where it is required.

Southern Medical News

The American Association for the Study of Goiter will meet in Memphis, Tennessee, May 15, 16 and 17, at the Peabody Hotel. A program covering the many phases of goiter has been arranged. Any physician in good standing in his local medical society is eligible to attend and participate in the discussions. Dr. R. L. Sanders, Memphis, Tennessee, is Chairman of the Program Committee.

ALABAMA

The Medical Association of the State of Alabama held its sixty-sixth annual meeting in Montgomery April 18-21, under the presidency of Dr. Samuel Kirkpatrick, Selma. Among the guest speakers on the program were Dr. Irvin Abell, Louisville, Kentucky, President of the Southern Medical Association; Dr.

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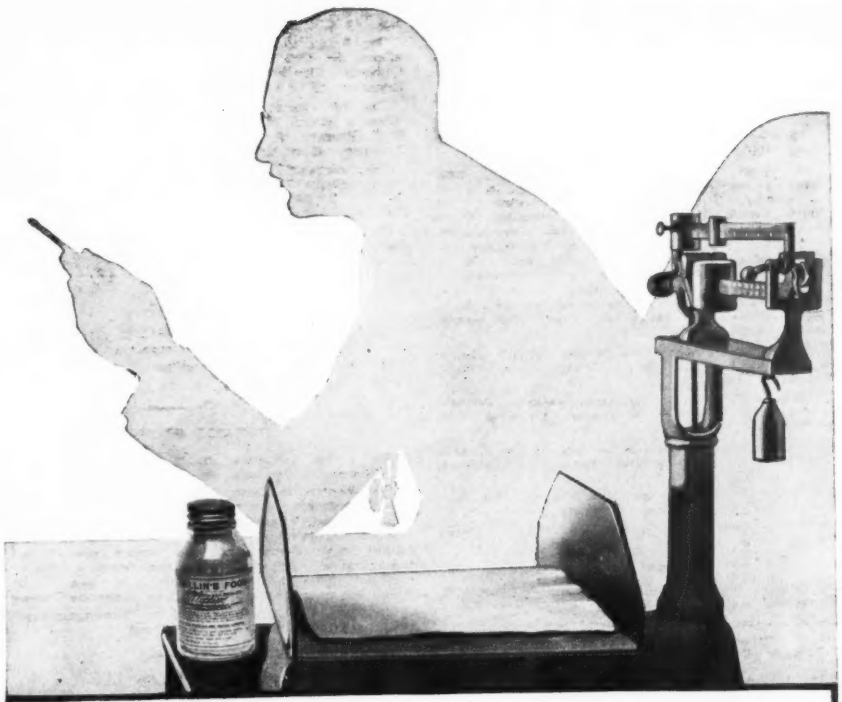

WHEN GROWTH IS RAPID

The physician must be sure that every element essential to growth and well-being is included in the diet of each infant under his supervision.

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Mellin's Food is a superior maltose and dextrins product. It is derived chiefly from wheat and malted barley, with potassium bicarbonate added. Samples gladly supplied to physicians—on request.

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Continued from page 480

Dean Lewis, Baltimore, Maryland, President-Elect of the American Medical Association; Dr. J. Shelton Horsley, Richmond, Virginia, a past President of the Southern Medical Association, who delivered the Jerome Cochran Lecture; Dr. Hugh J. Morgan, Nashville, Tennessee; Dr. Frank K. Boland, Atlanta, Georgia; Dr. Fred W. Rankin, Lexington, Kentucky; Dr. R. E. Semmes, Memphis, Tennessee; Dr. John J. Shea, Memphis, Tennessee; Dr. Robert Carothers, Cincinnati, Ohio; and Dr. R. Wesley Scott, Cleveland, Ohio.

Dr. James R. Garber, Birmingham, was elected, without opposition, President of the Medical Association of Alabama at its recent annual meeting. Dr. Garber is a past President of the Jefferson County Medical Society, is First Vice-President of the Southern Medical Association, and was General Chairman for the Southern Medical Association meeting in Birmingham last November. Other officers elected at the meeting were: Dr. A. B. Coxwell, Monroeville, Vice-President for the Southwestern Division; Dr. J. U. Ray, Woodstock, Treasurer (reelected); and Dr. Fred W. Wilkerson, Montgomery (reelected) and Dr. M. S. Davie, Dothan, members of the Board of Censors. The Association will meet in Birmingham in 1934.

Dr. Hugh C. McRee, formerly head of the Morgan County Health Unit, was recently named Health Officer of Lee County, with headquarters at Opelika.

Dr. John McLaughlin Forney, Tuscaloosa, recently addressed an open meeting at the University of Alabama School of Medicine, University.

Announcement has been made of the purchase by Dr. Thomas Wolford, Birmingham, of the Columbus Hospital at Columbus, Mississippi.

Dr. Walter Harvel Minor, Jr., and Miss Elizabeth Van Antwerp, both of Mobile, were married in February.

Dr. Ralph Mayo Clements, Luverne, and Miss Ima Carl Turner were married in February.

Deaths

Dr. James Wattie Fennell, Mount Hope, aged 58, died February 17 of chronic nephritis and myocarditis.

Dr. James W. Pruett, Weogufka, aged 65, died January 31 of carcinoma of the pancreas.

Dr. John Osgood Rush, Mobile, died February 14 of heart disease.

ARKANSAS

The Arkansas State Medical Society will hold its annual meeting in Hot Springs May 2, 3 and 4.

Dr. F. Vinsonhaler, Little Rock, has received a medal from the Columbia University, presented him in recognition of conspicuous service rendered the University.

Dr. George F. Jackson, Little Rock, has been made a member of the Board of Commissioners to supervise the personnel of the Fire and Police Departments.

The Benton County Medical Society has elected the following officers for 1933: Dr. J. T. Powell, Gravette, President; Dr. C. S. Wilson, Siloam Springs, Vice-President; and Dr. C. L. McNeil, Rogers, Secretary-Treasurer.

The Boone County Medical Society has elected the following officers for 1933: Dr. D. E. Evans, President; Dr. F. B. Kirby, Vice-President; and Dr. W. H. Poynor, Secretary-Treasurer; all of Harrison.

The Greene County Medical Society has elected the following officers for 1933: Dr. J. J. Hudgins, President; Dr. W. E. Ellington, Vice-President; and Dr. W. M. Majors, Secretary-Treasurer; all of Paragould.

The Hot Surings County Medical Society has elected the following officers for 1933: Dr. J. M. Williams, President; Dr. E. T. Bramlitt, Vice-President; and Dr. H. L. Brown, Secretary-Treasurer; all of Malvern.

The Independence County Medical Society has elected the following officers for 1933: Dr. E. M. Gray, Batesville, President; Dr. V. D. McAdams, Cord, Vice-President; and Dr. M. S. Craig, Batesville, Secretary-Treasurer.

The Ouachita County Medical Society at a recent meeting reelected all of its officers for 1933, as follows: Dr. J. B. Jameson, Camden, President; Dr. T. E. Rhine, Thornton, Vice-President; and Dr. R. B. Robins, Camden, Secretary.

Deaths

Dr. William Luther Hartsell, Warren, aged 60, died February 4 in a Little Rock hospital of empyema of the gallbladder.

Dr. William Franklin Hamilton, Tomahawk, aged 65, died January 8 of nephritis.

DISTRICT OF COLUMBIA

The Annual Scientific Assembly of the Medical Society of the District of Columbia was held April 25 and 26.

The Washington Heart Association, organized about three years ago for physicians interested mainly in the scientific study of heart disease, is extending its membership to include laymen, and its extension of activities will include preventive measures against heart disease and social service work to patients with heart disease. Officers of the organization for the current year are: Dr. James A. Lyon, President; Dr. Lewis C. Ecker, Vice-President; and Dr. James W. Esler, Secretary-Treasurer.

Dr. Bernard Lauriston Hardin, Jr., Washington, and Miss Dorcas Fletcher Hull were married March 11.

FLORIDA

Dr. Gerry R. Holden, Jacksonville, was elected President-Elect of the Southeastern Surgical Congress at their annual meeting in Atlanta in March.

The Florida Dermatological Association held its regular quarterly clinical meeting in Miami in February.

Dr. Robley D. Newton, Fort Myers, has moved into new offices in the Earnhardt Building.

Dr. Edwin C. Swift, Jacksonville, was recently elected to membership in the American College of Physicians.

Dr. Thaddeus S. Troy, Lake City, has been named Chief Medical Officer for the new veterans' home at St. Petersburg.

The Tampa quarantine station at Mullet Key is to be transferred to property donated by the Tampa Chamber of Commerce and located at Gadsden Point.

The Victoria Hospital Staff, Miami, has elected the following

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THE JEFFERSON MEDICAL COLLEGE of PHILADELPHIA

The One Hundred and Ninth Annual Session Begins September 20, 1933, and ends June 1, 1934

FOUNDED 1825. A CHARTERED UNIVERSITY SINCE 1838. Graduates number 15,617, about 6,000 of whom are active in medical work. Graduates in every state and many foreign countries.

FACILITIES: The new College building, including provisions which make this institution one of the most modern medical colleges in this country, was opened in 1929. The Curtis Clinic providing for out-patient care and teaching was opened in October, 1931. In addition the College owns and controls separate Anatomical Institute; Department for Diseases of the Chest; unusual and superior clinical oppportunities in the Jefferson Hospital containing a clinical amphitheater; clinical laboratories; maternity department; teaching museums and free libraries. Altogether there are seven buildings owned and controlled by the College. Instruction privileges are granted in four other hospitals.

FACULTY: Eminent medical men of national reputation and unusual teaching ability.

ADMISSION: Not less than three college years leading to a degree in science or art, including specified science and language courses. Preference is given to those who have completed additional work.

APPLICATIONS should be made early.

ROSS V. PATTERSON, M.D., Dean

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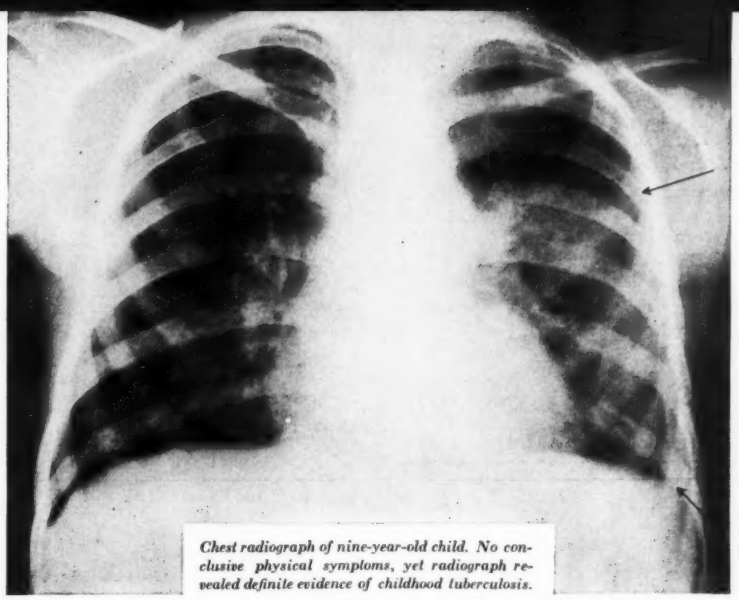

Chest radiograph of nine-year-old child. No conclusive physical symptoms, yet radiograph revealed definite evidence of childhood tuberculosis.

YOU are called upon to treat a child patient. He presents symptoms which might indicate bronchopneumonia, bronchiectasis, asthma, enlarged thymus, or atelectasis. But no matter how skilled a clinician you may be, you cannot safely exclude the possibility of tuberculosis because of negative findings from physical examination alone.

For in tuberculosis of the childhood type, the primary focus is small; there are no definite percussion notes. And râles usually are absent.

Only radiographs can provide the positive information necessary for differential diagnosis. They alone can show conditions as they actually are—provide conclusive proof of the type of infection.

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Constant improvement in radiographic methods and materials has greatly increased the value of x-ray service to the physician. To provide a dependable recording medium, the Eastman Kodak Company has produced Eastman Ultra-Speed X-ray Film. Because it is so sensitive and uniform, your radiologist is enabled to employ the most modern and effective technic, and provide radiographs of outstanding diagnostic quality.

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UNDERWEIGHT—Added to the regular meals, it is a valuable building food for the undernourished.

Samples upon request

HORLICK'S ACCEPTED AMERICAN MEDICAL ASSN. Racine, Wis.

Continued from page 18

officers for the coming year: Dr. John Milton, President; and Dr. F. A. Vogt, Vice-President.

The Walton-Okaloosa County Medical Society has elected the following officers for 1933: Dr. E. L. Huggins, Freeport, President; Dr. S. E. Stevens, Laurel Hill, Vice-President; and Dr. A. G. Williams, Lakewood, Secretary-Treasurer. This Society has been placed on the Honor Roll for 100 per cent payment of dues for 1933.

Dr. Leroy H. Oetjen, Leesburg, has moved into new offices at Perkin and Herndon Streets.

Dr. Ralph E. Stevens, Sanford, has been made a member of the Staff of the new Veterans' Administration Hospital at St. Petersburg.

Mr. T. F. Alexander has been chosen to succeed Dr. Robert E. Baldwin, deceased, as Superintendent of the Tampa Municipal Hospital.

Dr. Harold E. Miller, New Smyrna, and Miss Margaret Easterling were married in February.

Deaths

Dr. Charles Rush Gray, Trenton, aged 42, died February 1 of heart disease.

Dr. Joseph Robert Simpson, Miami, aged 51, died February 13 of heart disease.

Dr. John E. Henshall, Lakeland, aged 74, died January 7 of carcinoma of the prostate.

Dr. Bascom William Hamrick, Lee, aged 52, died January 20.

Dr William Emory Neiberger, Clearwater, aged 80, died February 7 of pulmonary tuberculosis.

GEORGIA

Physicians of Macon have organized the Mulberry Street Clinic offering medical, surgical and dental service to any who are recommended as worthy and unable to pay for these services. The medical and surgical staff consists of Dr. I. H. Adams, President; Dr. Wallace L. Bazemore, Vice-President; Dr. W. C. Boswell, Secretary; Dr. A. M. Phillips, Treasurer and Business Manager; Dr. R. G. Newton, Dr. R. W. Richardson, Dr. V. H.

Continued on page 22

TRADE-MARK

PYRIDIUM

"COUNCIL ACCEPTED" AMERICAN MEDICAL ASSN.

Phenylazo-Alpha-Alpha-Diamino-Pyridine Mono-Hydrochloride (Mfd. by The Pyridium Corp.)

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Pyridium administered by mouth in tablet form provides a convenient method of obtaining antibacterial action against infections in the genito-urinary tract:

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Continued from page 20

McMichael, Dr. Leon D. Porch, Dr. W. R. Golsan, Dr. James A. Fountain, Dr. J. A. Selden, Dr. C. N. Wasden, Dr. John I. Hall and Dr. J. R. Jordan.

Dr. and Mrs. C. J. Maloy, Helena, announce the establishment of the Kenneth Maloy Memorial Clinic for the benefit of underprivileged children in Telfair and adjoining counties.

Dr. J. B. H. Day, Social Circle, is the newly elected Chairman of the Staff of the Walton County Hospital at Monroe.

Dr. W. D. Jennings, Augusta, is the newly elected Chairman of the Board of Trustees of University Hospital; Dr. L. P. Holmes, Superintendent; and Dr. H. W. Shaw, Chairman of the Purchasing Committee.

The Georgia Conference for Social Work met in Augusta at the Hotel Richmond April 24, 25 and 26.

Dr. Daniel M. Bradley, Waycross, is the newly elected Commissioner of Health of Ware County.

Dr. Webb Conn, Brunswick, is the newly elected Health Commissioner for Glynn County.

Dr. Howard J. Morrison, Savannah, has moved into new offices at 3 East Gordon Street, practice limited to pediatrics.

Dr. C. W. Strickler is the newly elected President of the Staff of Grady Hospital, Atlanta; Dr. George W. Fuller, Vice-President; and Dr. Jack C. Norris, Secretary-Treasurer.

Dr. Alton M. Johnson, Valdosta, has opened his office in the Exchange Bank Building, practice limited to diseases of infants and children.

Dr. Arthur N. Berry, Columbus, has opened offices in the Murrah Building, where he will engage in general practice.

Dr. Frank K. Boland, Atlanta, recently addressed the graduating class of nurses at Oglethorpe Private Infirmary, Macon.

Dr. J. E. Penland and Dr. W. D. Mixson, both of Waycross, recently entertained members of the Ware County Medical Society and dentists of Waycross at dinner.

Dr. William Charles Boswell, Macon, and Miss Doris Elizabeth Glisson were married in January.

The Ware County Hospital Staff, Waycross, entertained members of the Ware County Medical Society at dinner in February.

The Burke County Medical Society has elected the following officers for the coming year: Dr. H. F. Bent, Midville, President; Dr. W. C. McCarver, Vidette, Vice-President; and Dr. W. R. Lowe, Midville, Secretary-Treasurer.

The Macon County Medical Society has elected the following officers for the coming year: Dr. B. D. Frederick, Marshallville, President; and Dr. Thomas M. Adams, Montezuma, Secretary-Treasurer.

The Sumter County Medical Society has elected the following officers for the coming year: Dr. S. A. Scruggs, President; Dr. J. T. Stukes, Vice-President; and Dr. A. C. Primrose, Secretary-Treasurer; all of Americus.

The Troup County Medical Society has elected the following officers for the coming year: Dr. E. C. Herman, LaGrange, President; Dr. C. O. Williams, West Point, Vice-President; and Dr. Enoch Callaway, LaGrange, Secretary-Treasurer.

Deaths

Dr. Mell Aycock, Atlanta, aged 39, died February 25 of carcinoma of the liver.

Dr. Samuel A. V. Christiphine, Attapulgus, aged 64, died suddenly February 22 of heart disease.

Dr. James Edward Pennington, Esom Hill, aged 73, died February 13.

Dr. George Turner Horne, Augusta, aged 72, died suddenly March 6 of heart disease.

Dr. Andrew Cook Johnson, Garfield, aged 60, died suddenly February 20.

Dr. Valentine H. Taliaferro, Eatonton, aged 65, died February 25 of angina pectoris.

Dr. William Aaron Gibson, Jr., Thomson, aged 40, died suddenly February 27.

Dr. Ellis H. Adams, Porterdale, aged 81, died February 20.

Continued on page 24

A WATER OF CONSTANT COMPOSITION

In order to obtain uniform results from the use of an alkaline mineral water, it is important that the water be always of the same composition.

Kalak is a palatable carbonated water containing various alkaline mineral salts in constant proportions.

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The newest curative agent for MALARIA

As compared with the prolonged medication necessary with quinine, treatment with Atabrine generally requires only five days.

Malarial paroxysms in tertian and quartan fevers cease after the second or third day.

Both schizonts and gametes disappear in less than a week.

Vertigo, tinnitus and headache are avoided.

How Supplied: In tablets of 0.1 Gm. (1½ grains), with groove for division, in tubes of 15.

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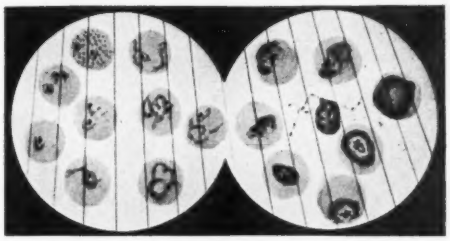
Adults: 1½ grains three times daily for 5 successive days. *Children:* ¾ to 1½ grains, once to thrice daily according to age.

In subtertian (estivo-autumnal) malaria, Atabrine destroys the schizonts but only slightly affects the subtertian gametes. Hence Plasmochin (Reg. U. S. Pat. Off. Brand of Aminoquin), in daily adult doses of 0.03 Gm., must be added to effect a complete cure in this form of malaria.

TERTIAN

ATABRINE destroys

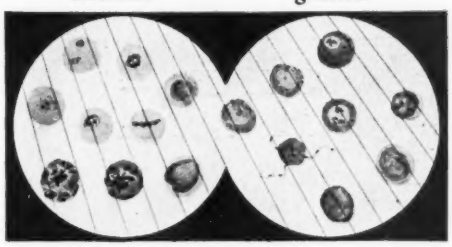
schizonts *gametes*



QUARTAN

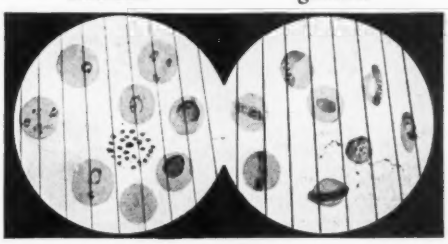
ATABRINE destroys

schizonts *gametes*



SUBTERTIAN

ATABRINE destroys schizonts — *PLASMOCHIN destroys gametes*



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Continued from page 22

KENTUCKY

Dr. Lawson Hubert Medley, Lexington, has succeeded Dr. George L. Thompson, Owensboro, as Health Director of Daviess County, Dr. Thompson having been made Health Officer of McLean County.

Madge Hammette has resigned as Superintendent of the Children's Free Hospital, Louisville, and is succeeded by Elsie DeLin, formerly Assistant Superintendent.

The Letcher County Medical Society has elected the following officers for the coming year: Dr. G. D. Ison, Blakey, President; Dr. B. C. Beck, Whitesburg, Vice-President; and Dr. R. Dow Collins, Whitesburg, Secretary-Treasurer.

The Third District Medical Society has elected the following officers for the coming year: Dr. G. W. Bushong, Tompkinsville, President; Dr. E. D. Turner, Cave City, Vice-President; and Dr. John H. Blackburn, Bowling Green, Secretary.

DEATHS

Dr. Gus H. Covington, Wadesboro, aged 89, died February 25 of pneumonia.

Dr. Green W. Campbell, Hazard, aged 55, died February 12 of nephritis.

Dr. Marcus Lafayette Bryant, Pulaski, aged 79, died January 9.

Dr. Robert Lee Hackworth, Coral Ridge, aged 70, died January 11.

Dr. James H. Ashlock, Glendale, aged 76, died January 13.

Dr. John Smidt Preissler, Camp Taylor, aged 81, died February 8.

Dr. Theodore L. Gamblin, Burnside, aged 60, died suddenly January 8 of heart disease.

LOUISIANA

The annual meeting of the Louisiana State Medical Society, which was to have been held in Lake Charles April 25, 26 and 27, was cancelled, due to the economic crisis through which the State was passing.

Dr. Henry Dickson Bruns, New Orleans, Emeritus Professor of Diseases of the Eye, Tulane University of Louisiana School of Medicine, has been honored by the dedication to him of the Diagnostic Room for the Eye Department of the Eye, Ear, Nose and Throat Hospital. Upon the door of this room has been placed a bronze plaque in honor of Dr. Bruns.

Dr. Frank J. Chalaron is the newly elected Chairman of the Merch Hospital for 1933: Dr. Philip C. DeVerges, Vice-Chairman; Dr. Edwin L. Zander, Treasurer; and Dr. Theo F. Kirn, Secretary; all of New Orleans.

Dr. Hiram W. Kostmayer, New Orleans, Professor and Head of the Department of Gynecology, Tulane University Graduate School of Medicine, has been named Acting Dean of the school, it is reported, filling the vacancy made by the death of Dr. Henry Daspit.

The Louisiana State University Medical Center, New Orleans, was approved recently for Class A rating by the Council on Medical Education and Hospitals of the American Medical Association in Chicago.

Dr. Lionel L. Cazenavette, New Orleans, formerly in charge of the clinic for nervous diseases at Charity Hospital, has been appointed Superintendent of the City Hospital for Mental Diseases.

DEATHS

Dr. Walter Fisher Carstens, New Iberia, aged 57, died February 19 of cerebral hemorrhage.

MARYLAND

The Dohme Lectures were delivered at the Johns Hopkins University School of Medicine April 20-22 by Sir Henry H. Dale, Director of the National Institute for Medical Research.

Dr. Christian Beetjen, Baltimore, recently donated to the Medical and Chirurgical Faculty of Maryland his collection of x-ray tubes, which have been preserved almost from the beginning of his work, and show graphically the development of the science.

Dr. Llewellyn W. Lord and Mrs. Margaret Ward Jones, both of Baltimore, were married in January.

Dr. Ervin B. Wallace, Baltimore, and Miss Helen Haupert were married recently.

DEATHS

Dr. Charles Lawrence Bradshaw, Crownsville, aged 44, died February 22 of erysipelas.

Dr. John H. Rehberber, Baltimore, aged 82, died January 22 of arteriosclerosis and chronic myocarditis.

Dr. Marvel Smith Lingo, Newark, aged 44, died February 22.

Dr. William J. C. Corse, Baltimore, aged 87, died December 21.

Dr. William Oscar Whittle, Baltimore, aged 46, died February 2 of carcinoma of the stomach.

Dr. Donald Edward Davenport, Takoma Park, aged 46, died February 15 of brain tumor.

MISSISSIPPI

The Mississippi State Medical Association will hold its sixty-sixth annual session May 9-11 in Jackson, with headquarters at the Robert E. Lee Hotel.

Dr. Peter Whitman Rowland, University, was elected President-Elect of the Mid-South Postgraduate Medical Assembly at its meeting in Memphis in February.

The Mississippi State Hospital Association will hold its annual session at the Edwards Hotel, Jackson, beginning May 8.

The Columbus Hospital at Columbus, recently owned and operated by the late Dr. W. C. Brewer, has been purchased by Dr. Thomas Wolford, Birmingham, Alabama, and was opened for operation under the new management about April 1.

Dr. Robert Dickins, Greenville, formerly associated with the Drs. Gamble Brothers and Montgomery Clinic, has accepted an appointment at the Detroit Eye, Ear, Nose and Throat Hospital, Detroit, Michigan.

Dr. L. A. Barnett, Greenwood, has moved his office from Market Street to 808 West Washington Street.

Dr. Theodore Austin, Greenwood, will locate at Rochester, New York, where he has been appointed assistant resident physician at the Rochester General Hospital.

Dr. C. H. Tennent, formerly of Arkansas, is locating at Lumberton, with headquarters at the Southern Hotel.

Dr. W. G. Weston, Vicksburg, is moving to Kentucky to practice internal medicine.

Dr. Walter E. Johnston, Vicksburg, will leave shortly for Boston, Massachusetts, where he has accepted a position at the Marine Hospital.

Continued on page 26

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OXYGEN—
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Preoperatively, postoperatively, in chronic heart conditions, in pneumonias, is coming into real therapeutic use and value. We have all kinds of outfits for rentals and sales; like the one (Barach-Thurston) furnished by airplane from New York for Mayor Cermak.

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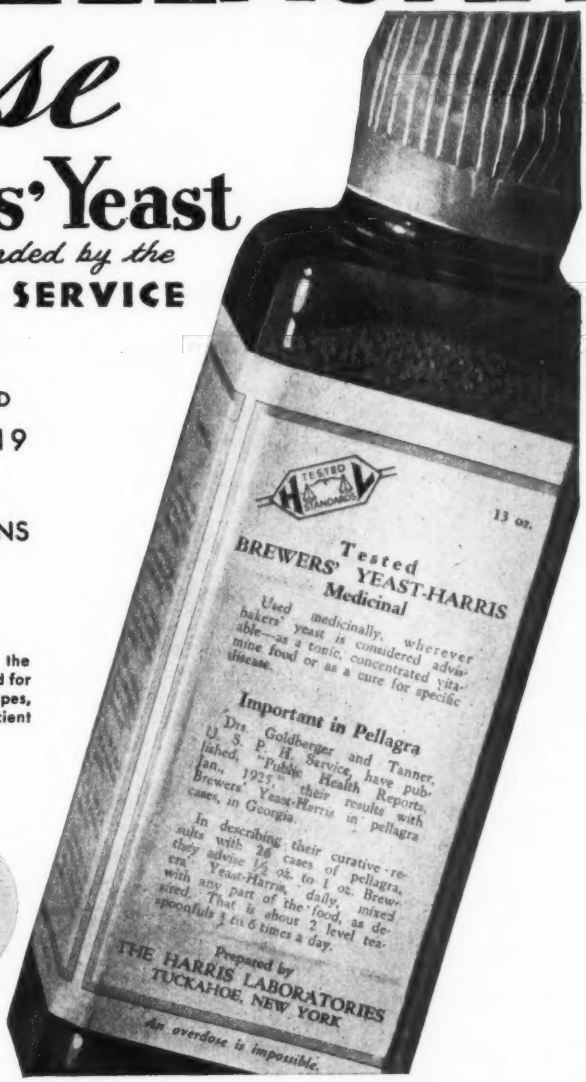
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Important in Pellagra
Drs. Goldberger and Tanner, U. S. P. H. Service, have published, "Public Health Reports, Jan., 1925," their results with Brewers' Yeast-Harris in pellagra cases, in Georgia.
In describing their curative results with 28 cases of pellagra, they advise ½ oz. to 1 oz. Brewera' Yeast-Harris, daily, mixed with any part of the food, as desired. That is about 2 level teaspoonfuls 3 to 6 times a day.
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Continued from page 24

The East Mississippi Medical Society announces a Postgraduate Medical Institute to be held June 6-9 at the Lamar Hotel, Meridian. The Institute will be conducted by Dr. Joseph Colt Bloodgood, Baltimore, Maryland, and Dr. George Herrmann, Galveston, Texas.

Deaths

Dr. Joseph Pendleton Stovall, Sardis, aged 76, died February 15 of cerebral hemorrhage.

Dr. J. W. Young, Grenada, aged 87, died February 15 of carcinoma of the prostate.

MISSOURI

The Kansas City Southwest Clinical Society held its April clinic at St. Joseph's Hospital, Kansas City, with Dr. Joseph W. Larimore, St. Louis, as the guest speaker for the clinic.

The Trudeau Lecture, sponsored annually by the St. Louis Trudeau Club, was delivered this year in April by Dr. Allen Krause, of Tucson, Arizona, at a joint session of the Trudeau Club and the St. Louis Medical Society.

Dr. and Mrs. F. W. Burke, Laclede, recently entertained members of the Linn County Medical Society and their wives at dinner.

Dr. and Mrs. Carl Barck, St. Louis, recently entertained at a reception honoring Dr. Joseph Mulzer, of Heidelberg University, Germany, upon his appointment to the Department of Ophthalmology at St. Louis University School of Medicine, St. Louis, Dr. Mulzer receiving the Carl Barck Ophthalmology Fellowship, the funds for which were provided by a group of friends of Dr. Barck on the golden anniversary of his graduation from the University of Freiburg, Baden, Germany.

Dr. W. G. Patton is the newly appointed Superintendent of St. Louis County Hospital at Clayton.

Dr. Rudolph V. Powell, St. Louis, is one of twenty-four physicians recently elected to membership in the American College of Physicians.

The midyear clinical meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons was held in St. Louis in March.

Dr. John F. Hardesty, St. Louis, was appointed a delegate to the Pan-American Medical Association meeting in Dallas in March.

The Ophthalmic Section of the St. Louis Medical Society and the St. Louis Ophthalmic Society held a joint session in St. Louis in April at the Oscar Johnson Institute.

The Howell-Oregon-Texas County Medical Society has elected the following officers for the coming year: Dr. Ford A. Barnes, Thayer, President; Dr. D. D. Cox, Pomona, Vice-President; and Dr. L. E. Toney, West Plains, Secretary and Treasurer.

Dr. August A. Werner, St. Louis, has moved into new offices in the Humbolt Building, Grand and Washington Boulevards.

Deaths

Dr. Harry Greensfelder, St. Louis, aged 54, died February 26 from an injury received in a fall.

Dr. James Franklin Hedrick, Weatherby, aged 61, died January 31 of heart disease.

Dr. Francis S. Stevenson, Aurora, aged 73, died February 10 of heart disease.

Dr. John Thomas Kimsey, Lathrop, aged 80, died January 22.

Dr. John Newell Waggoner, Canton, aged 48, died February 11.

Dr. Emil Theilmann, Kansas City, aged 68, died December 28 of carcinoma of the colon.

Dr. Earle Harrison Coon, Excelsior Springs, aged 52, died February 17 of peritonitis.

Dr. Franklin Edward Murphy, Kansas City, aged 61, died February 20 of heart disease.

Dr. Neldon Mason Weigle, St. Louis, aged 25, died January 7.

Dr. Robert C. Schroeder, St. Louis, aged 73, died January 31 of pneumonia.

Dr. John H. Cawood, St. Louis, aged 65, died February 10 of carcinoma.

Dr. Arthur V. Marquardt, St. Louis, aged 57, died March 1.

Continued on page 28

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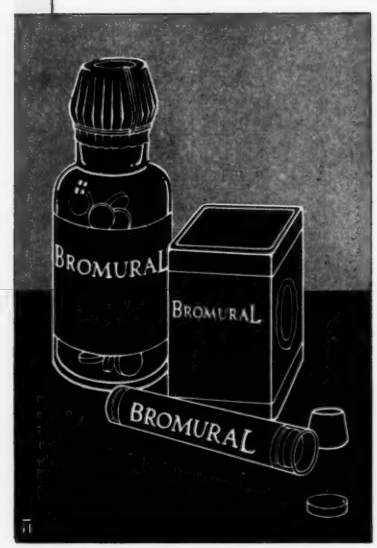

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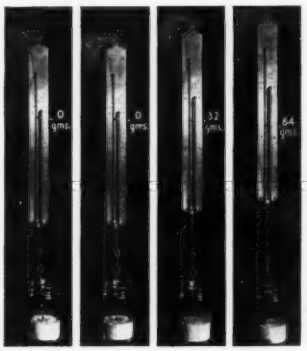

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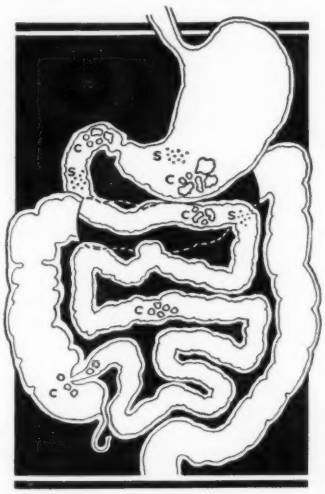

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Schematic drawing of the relative size of the curds of cow's milk and Similac vomited by six weeks old puppies after one-half hour's ingestion.

"FAT has a caloric value more than twice that of either carbohydrates or protein and serves very well to make up the necessary energy or caloric requirement. Two of the important vitamins, 'A' and 'D', are associated with the fat of milk and when the diet is low in milk fat these vitamins must be supplied in some other form." [1]

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The finer the curd the greater the surface area. The greater the surface area the more exposed are the fats, carbohydrates, proteins and salts to the digestive enzymes. Result . . . a more complete utilization of the food elements.

[1] Marriott: Infant Nutrition, pg. 49.

[2] Talbot: Morse and Talbot, Diseases of Nutrition and Infant feeding, pg. 48.

Samples and literature will be sent on receipt of your prescription blank.

SIMILAC—Made from fresh skim milk (casein modified); with added lactose, salts, milk fat and vegetable and cod liver oils.

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Continued from page 26

NORTH CAROLINA

Dr. Addison G. Brenizer, Charlotte, and Dr. B. C. Willis, Rocky Mount, recently gave clinics at the Duke Hospital at Durham.

Dr. A. W. Peede, Lillington, has been made physician for Harnett County.

Dr. D. E. Ford is the newly elected Health Officer for Beaufort County, having formerly served as Health Officer for Craven County.

Dr. Henry H. Menzies, Hickory, is the newly elected President of the Catawba Valley Medical Society, composed of physicians in Catawba, Burke, Lincoln and Caldwell Counties.

Dr. Julian W. Ashby, Raleigh, has been appointed to succeed Dr. Albert Anderson, deceased, as Superintendent of the State Hospital for Insane at Raleigh.

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A private maternity home for the care and protection of unfortunate girls during pregnancy and confinement.

Under auspices of Women's Christian Association of this city.

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The Medical Society of the State of North Carolina held its annual meeting in Raleigh April 17-19, with headquarters at the Sir Walter Hotel.

Dr. P. P. McCain, Sanatorium, was the guest speaker at the South Carolina Medical Society, April 20.

Dr. Leon Watson, Broadway, and Miss Anne Sheppard were married in January.

DEATHS

Dr. Clarence Albert Shore, Raleigh, aged 59, died February 10 of mesenteric thrombosis.

Dr. Arthur F. Reeves, Asheville, aged 52, died March 8 of coronary thrombosis.

Dr. George Alexander, Asheville, aged 44, died March 3 of coronary thrombosis while calling on a patient.

Dr. T. J. Stephenson, Seaboard, intern at the Bryn Mawr Hospital, died recently in a Philadelphia Hospital.

Dr. W. A. Thompson, Rutherfordton, aged 70, died February 27 from the effects of a fall.

Dr. J. L. Kernodle, Burlington, aged 63, died February 19 of heart disease.

OKLAHOMA

The Cleveland County Medical Society has elected the following officers for the coming year: Dr. Carl T. Steen, President; Dr. Eleanora Schmidt, Vice-President; and Dr. D. G. Willard, Secretary-Treasurer; all of Norman.

The Grady County Medical Society has elected the following officers for the coming year: Dr. J. F. Renegar, Tuttle, President; Dr. C. P. Mitchell, Chickasha, First Vice-President; Dr. C. P. Cox, Ninnekah, Second Vice-President; and Dr. L. E. Woods, Chickasha, Secretary-Treasurer.

The Kay County Medical Society has elected the following officers for the coming year: Dr. Merle C. Clift, President; Dr. W. S. White, Vice-President; and Dr. L. H. Becker, Secretary-Treasurer; all of Blackwell.

The Okmulgee County Medical Society has elected the following officers for the coming year: Dr. I. W. Bollinger, Henryetta, President; Dr. G. A. Kilpatrick, Henryetta, Vice-President; and Dr. M. B. Glismann, Okmulgee, Secretary-Treasurer.

DEATHS

Dr. John Eugene Stinson, Chickasha, aged 84, died February 17 of pneumonia.

Dr. Henry Juren, Oklahoma City, aged 82, died November 7 of heart disease.

Dr. George F. Woodring, Bartlesville, aged 76, died February 24 of pneumonia.

Dr. John Edwin Mahoney, Enid, aged 53, died February 7 of cerebral hemorrhage.

Dr. Charles D. Frederick O'Hern, Tulsa, aged 54, died December 10 of organic heart disease.

Dr. Bruce Webster Baker, Cordell, aged 43, died February 14 of cholecystitis.

SOUTH CAROLINA

Myrtle W. Littlejohn is the newly appointed Superintendent of the Marlboro County General Hospital at Bennettsville.

TENNESSEE

Dr. F. J. Runyan, Clarksville, was elected Vice-President of the Mid-South Postgraduate Medical Assembly at its recent meeting in Memphis.

Dr. Homer Reese, Galatin, has completed his postgraduate work at Vanderbilt and resumed his practice.

Dr. B. H. Harrison has moved to Mumford and is located in the former offices of Dr. J. B. Witherington.

Dr. J. E. Nelson and Dr. J. B. Phillips, Chattanooga, have moved into new offices in the Hardwick-Hogshead Building.

Dr. L. W. Nabers has opened his office in Morristown.

Dr. Gilbert Eblen has located in Lenoir City, where he is practicing with his father, Dr. J. G. Eblen.

DEATHS

Dr. Samuel E. Reynolds, Elizabethton, aged 69, died February 10 of cerebral hemorrhage.

Dr. James H. Atlee, Chattanooga, died January 31.

Dr. Samuel Houston Clemons, Chattanooga, aged 55, died January 18.

Dr. Thomas A. Wood, Bybee, aged 63, died January 13.

Dr. Thomas Nelson Kraus, Lenoir City, aged 73, died January 1.

Continued on page 30

DO YOU FACE THE "Tonic" QUESTION?

MANY physicians are disturbed by frequent requests from patients for a "tonic." The requests, for the most part, come from mothers of underweight children, whose real need may be an efficiently fortified or reinforced diet.

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The Borden Company has prepared a professional pamphlet called "Scientific Child Feeding," which offers more than 70 recipes in which the caloric values have been increased from 25% to 75% by incorporating Klim, the powdered whole milk. The flavor, bulk and texture of the dishes remain unchanged, though, of course, there is a favorable increase in the fat, protein, vitamin and mineral (particularly calcium and phosphorus) contents.

You can use this book—"Scientific Child Feeding"—in your practise. You will find it of inestimable value in directing child feeding—and also in guiding the diet of adults who need what is popularly known as a "tonic."

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Continued from page 28

Dr. Nathan Henry Reeve, Bristol, aged 85, died January 26 of chronic bronchitis and senility.

Dr. John F. Ausmus, Speedwell, aged 69, died February 11 of pneumonia.

Dr. Samuel W. Jenkins, Soddy, aged 84, died January 19 of influenza.

Dr. C. E. Fuller, Morristown, aged 86, died January 2.

Dr. Louis Wardlaw Haskell, Memphis, aged 54, died February 10.

Dr. Hilliard Wood, Nashville, aged 68, died February 23.

Dr. T. E. Watkins, Collierville, aged 46, died February 26.

TEXAS

The annual meeting of the Texas State Medical Association will be held in Fort Worth May 8-11.

The Texas Surgical Society held its semi-annual meeting in Temple April 17 and 18.

The new Adams and Farrar Hospital in Longview, a new two-story structure, was recently opened, with a capacity of nineteen private rooms and two wards.

Dr. P. R. Denman and Dr. Sidney Israel, Houston, are newly appointed members of the Jefferson Davis Hospital Board of Managers.

The West Texas Baptist Sanitarium at Abilene recently elected the following Staff officers: Dr. W. J. Mathews, President of the Staff; Dr. Scott Hollis, Vice-President; and Dr. Jack Estes, Jr., Secretary; all of Abilene.

Dr. John Hart is the newly elected President of the Staff of the Beaumont General Hospital; Dr. J. C. Crager is Vice-President; and Dr. Ernest Robertson, Secretary; all of Beaumont.

The Texas Tuberculosis Association will meet in Galveston for its annual session in May.

Dr. J. C. Allen, formerly of Hallsville, has moved to New Orleans, Louisiana.

Dr. Herman Klapproth has moved from Midland to Galveston.

Dr. Sallie W. Miller has moved from Slaton to El Paso.

Dr. Charles D. Reece has moved from Belton to Austin.

Dr. John W. Brown has moved from Marfa to Austin

Dr. A. B. Currie has moved from Smiley to Westhoff.

Dr. P. M. Waltrip, Jr., has moved from Fort Worth to Texon.

Saidee N. Hausmann is the newly appointed Superintendent of the Robert B. Green Memorial Hospital, San Antonio.

The Bell County Medical Society has elected the following officers for 1933: Dr. R. K. Harlan, President; Dr. E. V. Powell, Vice-President; and Dr. W. J. Graber, Jr., Secretary-Treasurer; all of Temple.

The Bexar County Medical Society has elected the following officers for 1933: Dr. Roy T. Goodwin, President; Dr. L. L. Lee, Vice-President; Dr. H. O. Wyneken, reelected Secretary; and Dr. E. V. DePew, Treasurer; all of San Antonio.

The Brooks-Duval-Jim Wells Counties Medical Society has elected the following officers for the coming year: Dr. C. K. Russell, Falfurrias, President; Dr. P. S. Joseph, Alice, Vice-President; and Dr. George Wyche, Alice, reelected Secretary-Treasurer.

The Coleman County Medical Society has elected the following officers for 1933: Dr. M. C. Barnes, Coleman, President; and Dr. Jason Tyson, Santa Anna, Secretary-Treasurer.

The Gonzales County Medical Society has elected the following officers for 1933: Dr. L. J. Stahl, Gonzales, President; Dr. N. A. Elder, Nixon, Vice-President; and Dr. W. T. Dawe, Gonzales, Secretary-Treasurer.

The Hutchinson County Medical Society has elected the following officers for 1933: Dr. R. E. Minter, President; Dr. A. F. Hansen, Vice-President; and Dr. L. C. Hansen, Secretary-Treasurer; all of Borger.

The Lubbock County Medical Society has elected the following officers for 1933: Dr. O. W. English, President; Dr. M. C. Overton, Vice-President; and Dr. Olan Key, Secretary-Treasurer; all of Lubbock.

DEATHS

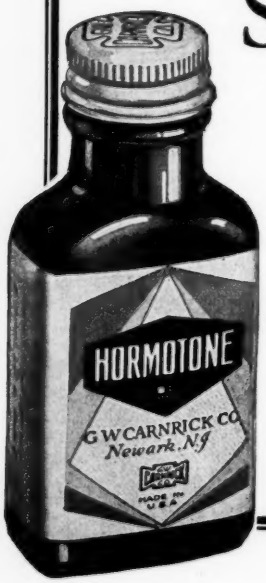
Dr. Thomas Franklin McGee, Lubbock, aged 82, died February 2 of hypertrophy of the prostate and chronic nephritis.

Dr. Marcellus N. Brown, Cuero, aged 75, died February 11 of pneumonia.

Dr. Walter Ellis Sistrunk, Dallas, aged 52, died March 6.

Dr. George Harlan Johnson, Quanah, aged 89, died January 26.

Continued on page 32



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Please send reprints: Dry Milk In Infant Feeding (Dennett); Acute and Habitual Vomiting in Infants; Diarrhea; The Prevention and Cure of Rickets through Irradiated Milk. Dryco—The Irradiated Milk.

Continued from page 30

Dr. John J. Trichel, Houston, aged 52, died January 31 of injuries received in an automobile accident.

Dr. George Edward Delaney, Galveston, aged 58, died February 20 of cerebral thrombosis.

Dr. Adam Rush King, Fort Worth, aged 55, died February 14 of heart disease.

Dr. William H. Oliver, Bryan, aged 63, died February 7 of heart disease.

Dr. John C. Findlater, San Angelo, aged 39, died January 13 of pneumonia.

Dr. Frank Elmore Thompson, San Angelo, aged 62, died December 29.

Dr. Isaac N. Roberson, Nancy, aged 67, died January 1 of heart disease.

VIRGINIA

At a regular meeting of the Richmond Academy of Medicine, Richmond, host to the Southern Medical Association meeting in November, held early in April, the President, Dr. Carrington Williams, announced the following appointments of Chairmen for handling that meeting: Dr. Fred M. Hodges, General Chairman; Dr. Stuart McGuire, Dr. J. Shelton Horsley and Dr. J. K. Hall, Honorary Vice-General Chairmen; Dr. W. H. Higgins, Finance; Dr. Beverley R. Tucker, Entertainment; Dr. I. A. Bigger, Program or Clinics; Dr. R. Finley Gayle, Jr., Meeting Places; Dr. J. Powell Williams, Hotels; Dr. Jos. F. Geisinger, Publicity; Dr. W. Ambrose McGee, Scientific Exhibits; Dr. J. B. Dalton, Technical Exhibits; Dr. H. H. Ware, Jr., Alumni Reunions and Fraternity Luncheons; Dr. C. M. Caravati, Membership; Dr. J. S. Horsley, Jr., Information; Dr. Arthur S. Brinkley, Transportation; Dr. Garland Harwood, Signs and Badges; Dr. J. L. Tabb, Lanterns; Dr. Paul W. Howler, Golf; Dr. W. B. Porter, Trap Shooting; Dr. Pauline Williams, Women Physicians; and Mrs. Stuart McGuire, Chairman, and Mrs. J. B. Dalton, Vice-Chairman, Ladies' Entertainment.

The Richmond Academy of Medicine, Richmond, had as guest speakers at their regular meeting early in April, Dr. William Gerry Morgan and Dr. Wallace Yater, of Washington, D. C.; and Mr. C. P. Loranz, Birmingham, Alabama, Secretary-Manager of the Southern Medical Association.

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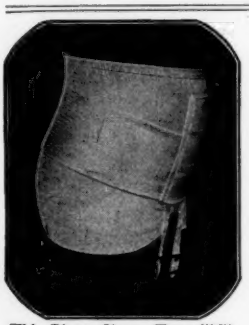

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The Accomack Medical Society has elected the following officers for 1933: Dr. Ira Hurst, Parksley, President; Dr. A. F. Wood, Parksley, Vice-President; and Dr. John W. Robertson, Onancock, reelected Secretary-Treasurer.

The Medical College of Virginia has been presented with a portrait of Dr. Richard L. Bohannan, the first Professor of Obstetrics and Diseases of Women and Children, and one of the founders of the College; the portrait to be placed in the Founders' Room in the new library by the descendants of Dr. Bohannan.

Dr. Hugh Trout, Roanoke, recently gave a clinic at Duke Hospital, Durham, North Carolina.

Dr. W. W. S. Butler, Jr., Roanoke, recently gave a clinic at Duke Hospital, Durham, North Carolina.

Dr. George W. Parrott, formerly of Charlottesville, has moved to New Market, where he will engage in general practice.

Dr. E. G. Gill, Roanoke, is the newly appointed member of the Board of Visitors of the Virginia School for Deaf and Blind at Staunton, succeeding Dr. J. H. Lindsay, deceased.

Dr. James Wilbert Love has located at Alexandria, with offices at 108 North Washington Street.

Dr. U. W. Massie has moved from Fincastle to Longacre, West Virginia.

Captain Claude L. Neale and Captain Clyde L. Brothers, both recent graduates of the Medical College of Virginia, have been transferred to the Hawaiian Islands.

Dr. William H. Turner, Jr., who has been doing missionary practice in China, has located in Gordonsville, where he will engage in general practice.

Dr. J. Shelton Horsley, Richmond, was invited to give the Porter Lectures at the University of Kansas in March.

Dr. Ramon D. Garcin, Richmond, was the recipient recently of an automobile presented to him by the Grand Lodge of Virginia Masons in appreciation of Dr. Garcin's thirty-three years of service as physician at the Virginia Masonic Home for Children of Masons.

The eleventh of the regular semi-annual postgraduate clinics at the University of Virginia Hospital will be held May 4 and 5.

The Gill Memorial Eye, Ear and Throat Hospital, Roanoke, has postponed the seventh annual spring graduate course scheduled for this year.

The third annual graduate clinic for negro physicians will be held June 19 to July 1 at St. Philip Hospital in Richmond.

Dr. Earle Rawlings Ware, Fredericksburg, and Miss Jane Tuggle Epes were married March 11.

Dr. Willie Kerns Dix, Richmond, and Miss Avis Clifford Mathews were married in February.

Dr. David Lemuel Harrell, Jr., Suffolk, and Miss Katie Mae Moore were married in January.

Deaths

Dr. Frederick Hutchison, Aldie, aged 80, died February 20 of cerebral hemorrhage.

Dr. Thomas Vaden Brooke, Sutherlin, aged 85, died March 12.

Dr. George Wythe Tompkins, Coeburn, aged 60, died February 27.

Dr. Adam Tyree Finch, Chase City, aged 60, died February 22.

Dr. William A. Vaughan, Timberville, aged 74, died March 1.

Dr. James McTeer Miller, Wytheville, aged 63, died suddenly March 12 of myocardial failure.

Dr. Martin D. Delaney, Alexandria, aged 53, died February 10.

WEST VIRGINIA

The West Virginia State Medical Association will hold its sixty-sixth annual meeting in Charleston May 22-24.

Dr. U. W. Massie has located at Longacre, coming from Fincastle, Virginia.

The Raleigh County Medical Society has elected the following officers for the coming year: Dr. R. W. Chambers, Amigo, President; Dr. L. E. Shrewsbury, Beckley, First Vice-President; Dr. W. H. Cunningham, Beckley, Second Vice-President; and Dr. M. M. Ralsten, Beckley, reelected Secretary-Treasurer.

Deaths

Dr. Leander B. Dean, Kenova, aged 72, died February 5.

Dr. Arthur Deane Dunn, Cashmere, aged 70, died suddenly January 20 of heart disease.

Dr. Richard Gestell, Keyser, aged 81, died January 13 of arteriosclerosis, hypertrophy of the prostate and bronchopneumonia.

Dr. John Rollin Shultz, Charleston, aged 42, died February 6.

Dr. M. F. Hamilton, Mannington, aged 74, died suddenly March 19 of heart disease.

Urine actually becomes GERMICIDAL

CAPROKOL (Hexylresorcinol, S & D) is taken by mouth and excreted by the kidneys appearing largely as a conjugate, but in sufficient concentration in the free state to impart active bactericidal properties to the urine.

Hence, its activity in the treatment of urinary infections.

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PHARMACEUTICALS — BIOLOGICALS

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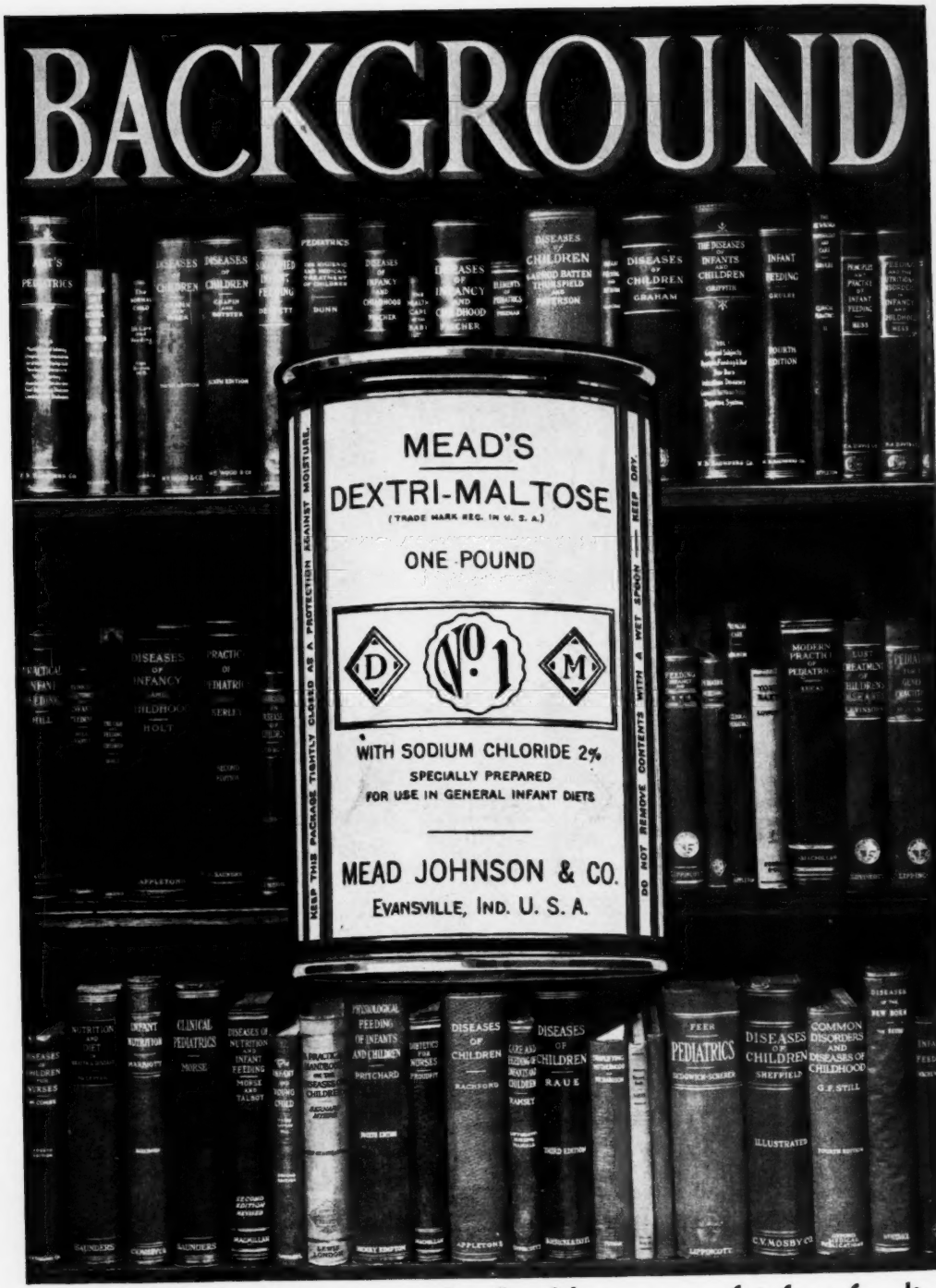
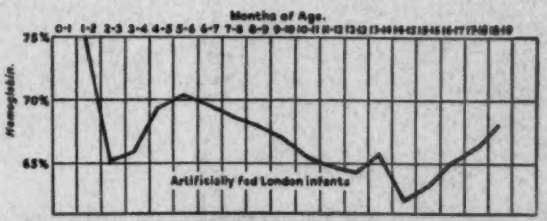


Not a baby food, but part of a flexible system of infant feeding

Mead's Dextri-Maltose owes its wide use and acceptance by physicians to its inherent merit as a carbohydrate well tolerated by infants, and to the fact that it is a part of a flexible system of infant feeding in which the art and science of the physician, rather than the artifices of any manufacturer, predominate.

Preventing NUTRITIONAL ANEMIA *in Infants through a Normal Dietary Regimen*

NUTRITIONAL anemia was present in 45% of the breast-fed and 51% of the bottle-fed in a group of more than 1,000 infants studied by Mackay.[1] Although this anemia was of mild degree, *it was sufficient approximately to double the morbidity among the artificially fed.*



Hemoglobin level in the blood of infants of various ages. Note fall in hemoglobin, which is closely parallel to that of diminishing iron reserve in liver of average infant. Chart adapted from Mackay.[1]

Anemia Prevalent

Commenting on this work, the British Advisory Committee on Nutrition writes, "This form of anaemia is prevalent among infants, especially those living under conditions of city life, and is attributed to a deficiency of available iron and possibly also of copper. Its most important feature is susceptibility to infection, particularly a liability to colds, otorrhoea, bronchitis, and enteritis, and a tendency for infections to become chronic."[2]

Iron, incorporated in powdered milk, should be given as a routine to bottle-fed infants, according to the recommendations of this committee in a report to the Ministry of Health.

Milk Deficient in Iron

Stored in the liver of the full-term infant is a supply of iron and copper theoretically sufficient for the first six months of life. But actually the reserve is subject to wide variation, probably because of (except in the case of prematures and twins) variations in the iron content of the mother's diet during pregnancy. Hill, for example, says, "If the mother is anemic herself, or if she has eaten little iron-containing food during the last months of pregnancy, her offspring is born with an insufficient iron deposit. . . ."[3]

	IRON	COPPER
Cow's Milk, 14 oz.	1.01 mg.	0.166 mg.
Dextri-Maltose with Vitamin B, 1 oz.	2.40	0.570
	3.41	0.736
Daily Requirement*	3.11	"traces"

It is generally agreed that breast milk and particularly cow's milk are markedly deficient in iron and copper. But when 1 oz. of Dextri-Maltose with Vitamin B is added to 14 oz. cow's milk, properly diluted (as at 1 month), the above increase in iron and copper results.

FOR the same reason that it is desirable to reinforce the milk supply of the infant with iron and copper, the trend is toward the introduction of iron-rich solid foods at an early age. The iron content of many foods is variable, however. Leichsenring and Flor[4] found that children's diets planned to contain 5 and 8.5 mg. iron actually contained only 3.25 and 6.5 mg., respectively. Mead's Cereal, higher than most foods in iron and containing standardized amounts of this mineral together with copper, can be administered as early as the third month, when nutritional anemia begins to appear (see chart above). Clinical studies by Summerfeldt[5] show that Mead's Cereal is capable of increasing the hemoglobin percentage of growing children.

	IRON	COPPER
Cow's Milk, 20 oz.	1.44 mg.	0.24 mg.
Dextri-Maltose with Vitamin B, 1½ oz.	3.60	0.855
Mead's Cereal (dry), ¼ oz.	1.70	0.09
	6.74	1.185
Daily Requirement*	4.18	"traces"

When ¼ oz. of Mead's Cereal is fed to the 3-months-old infant receiving 20 oz. cow's milk and 1½ oz. Dextri-Maltose with Vitamin B, a significant increase in iron and copper takes place.

* The desirable iron intake for children according to Rose *et al*, is 0.76 mg. per 100 calories. Infant of 1 month (8¼ lb.) and infant of 3 months (11¼ lb.), both require 80 calories per lb.[6]

1-6 *Bibliography on request.*

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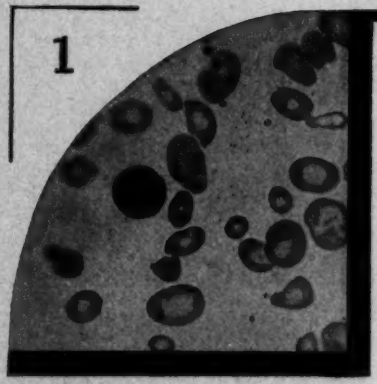
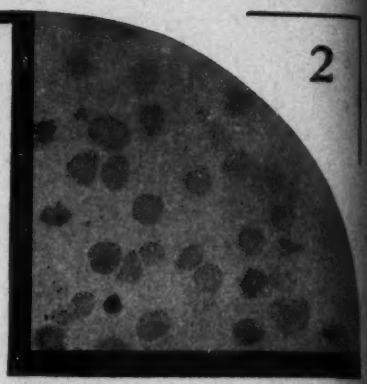


At left—Pernicious Anemia pretreatment level. R. B. C. 820,000 per cu. mm.; Hb. 17%. Started Ventriculin 40 Gm. daily.

At right—Fourth day of treatment. Reticulocytes 54%; R. B. C. 1,120,000 per cu. mm.; Hb. 24%.



BACK OF EVERY DOSE OF VENTRICULIN IS THE PRECISE HEMATOLOGIC RECORD OF ACTUAL CLINICAL TESTS MADE ON SUITABLE CASES OF PERNICIOUS ANEMIA

Each manufactured lot of Ventriculin (Desiccated Defatted Hog Stomach) is clinically tested and approved by the Thomas Henry Simpson Memorial Institute for Medical Research of the University of Michigan, Ann Arbor, Mich., before it is released for commercial distribution.

The required dosage is accurate and easily determined—10 grams daily for each million deficit in the erthyrocyte count. The average maintenance dose is 10 grams daily. Elderly patients and those with complications may require more.

Ventriculin, P. D. & Co., is palatable, non-hygroscopic, and stable. It is suitable for prolonged treatment and does not induce nausea or aversion on continued administration. Accepted by the Council on Pharmacy and Chemistry of the American Medical Association.

PACKAGES

Supplied in packages of 12 and 25 vials, each vial containing 10 grams—also in an "Economy Package," a 100-gram bottle.

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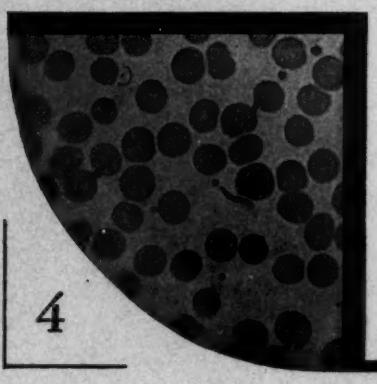
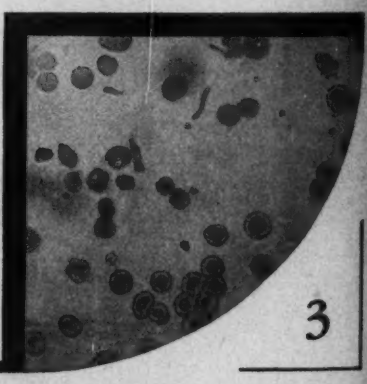


At right—Seventeenth day of treatment. R.B.C. 2,440,000 per cu. mm.; Hb. 56%.

At left—Sixty-sixth day of treatment. R.B.C. 4,610,000 per cu. mm.; Hb. 84%.